MSI
MICRO-STAR INTERNATIONAL

845G Max
845G Max-L
MS-6580 (v1.X) ATX Mainboard

Version 1.0
G52-MA00593

CE   **N1996**
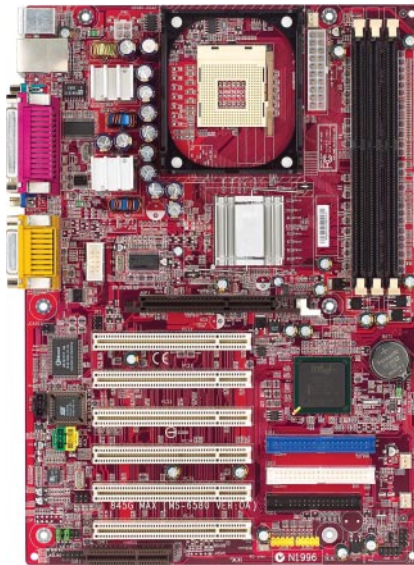
FCC-B Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.
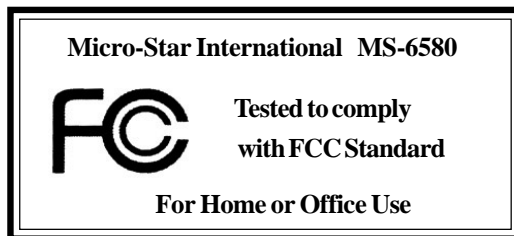
Notice 1
The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notice 2
Shielded interface cables and A.C. power cord, if any, must be used in order to comply with the emission limits.

VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RESEAU.

Micro-Star International   MS-6580
FC   Tested to comply with FCC Standard
For Home or Office Use

Edition

Apr. 2002

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Revision History

Revision	Revision History	Date
1.0	First Release	Apr. 2002

Safety Instructions

1. Always read the safety instructions carefully.
2. Keep this User's Manual for future reference.
3. Keep this equipment away from humidity.
4. Lay this equipment on a reliable flat surface before setting it up.
5. The openings on the enclosure are for air convection hence protects the equipment from overheating. DO NOT COVER THE OPENINGS.
6. Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
7. Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
8. Always Unplug the Power Cord before inserting any add-on card or module.
9. All cautions and warnings on the equipment should be noted.
10. Never pour any liquid into the opening that could damage or cause electrical shock.
11. If any of the following situations arises, get the equipment checked by a service personnel:
    - The power cord or plug is damaged
    - Liquid has penetrated into the equipment
    - The equipment has been exposed to moisture
    - The equipment has not work well or you can not get it work according to User's Manual.
    - The equipment has dropped and damaged
    - If the equipment has obvious sign of breakage
12. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT UNCONDITIONED, STORAGE TEMPERATURE ABOVE 60^0C (140^0F), IT MAY DAMAGE THE EQUIPMENT.

CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

CONTENTS

Getting Started 1

Thank you for purchasing 845G Max (MS-6580) series ATX motherboard. The 845G Max (MS-6580) series is a superior computer mainboard based on **Intel 845G & ICH4** chipsets for optimal system efficiency. Designed to fit the advanced Intel® Pentium® 4 processors in the 478 pin package, the motherboard provides a high performance and professional desktop platform solution.

There are two models available for 845G Max series mainboards: **845G Max** and **845G Max-L**. 845G Max does not support the LAN function while 845G Max-L is implemented with the LAN function and offers an onboard LAN RJ-45 jack.

Mainboard Specification

CPU
❏ Supports Socket 478 for Intel® Pentium 4 processor
❏ Supports 1.3GHz, 1.4GHz, 1.5GHz, 1.6GHz, 1.7GHz, 1.8GHz, 1.9GHz, 2GHz, 2.1GHz, 2.2GHz, 2.26GHz, 2.4GHz and up

Chipset
❏ Intel® 845G chipset (788 FC-BGA)
  - AGP 4x slot (**1.5V only**)
  - Integrated graphic controller
  - Supports 100/133MHz FSB
  - Supports 400/533MHz Intel NetBurst micro-architecture bus
❏ Intel® ICH4 chipset (421 BGA)
  - AC'97 2.2 interface
  - 6 USB 2.0/1.1 ports
  - 2 channel Ultra ATA/100 Bus Master IDE controller
  - SMBus 2.0 support
  - Integrated LAN controller

Main Memory
❏ Three 184-pin DDR DIMM sockets
❏ Supports 64 to 512MB technologies for x8 and x16 devices

Slots
❏ One AGP (Accelerated Graphics Port) 4x slot (**1.5V only**)
❏ Six PCI 2.2 32-bit Master PCI Bus slots (supports 3.3V/5V PCI bus interface)
❏ One CNR (Communication Network Riser) slot

On-Board IDE
❏ An IDE controller on the ICH4 chipset provides IDE HDD/CD-ROM with PIO, Bus Master and Ultra DMA 66/100 operation modes.
❏ Can connect up to 4 IDE devices

On-Board Peripherals
❏ On-board Peripherals include:
  - 1 floppy port supports 2 FDDs with 360K, 720K, 1.2M, 1.44M and 2.88Mbytes
  - 2 serial ports (COM A + COM B pin header), 1 VGA port
  - 1 parallel port supports SPP/EPP/ECP mode

- 6 USB 2.0/1.1 ports (Rear * 2 / Front * 4)
- 1 Line-In/Line-Out/Mic-In/Game port
- 1 RJ45 connector (optional)

Network (845G Max-L only)
❑ ICH4 Integrated LAN controller
❑ Intel 82562ET
   - ACPI and APM supported
   - Wake-On-LAN and WFM 2.0 supported

Audio
❑ ICH4 chip integrated
❑ AC'97 2.2 compliant

BIOS
❑ The mainboard BIOS provides "Plug & Play" BIOS which detects the peripheral devices and expansion cards of the board automatically.
❑ The mainboard provides a Desktop Management Interface (DMI) function which records your mainboard specifications.

Dimension
❑ ATX Form Factor: 30.5 cm (L) x 21.5 cm (W)

Mounting
❑ 6 mounting holes

Others
❑ AC'97 Audio onboard
❑ Vcore/Vio adjustable
❑ STR/STD support
❑ PC2001 compliant

Mainboard Layout

Top : mouse
Bottom: keyboard

JPW1

CPUFAN1

USB ports

SOCKET 478

ATX Power
Supply

DDR 1

DDR 2

DDR 3

Top : Parallel Port

Bottom:
COM A
VGA port

Intel
845G
chipset

Top :
Game port

COM 2

Bottom:
Line-Out
Line-In
Mic

AGP Slot

JCASE1

IR1

PCI Slot 1

Winbond
W83627HF-AW

PCI Slot 2

BATT
+

FWH

PCI Slot 3

ICH 4

CD_IN1

JBAT1

JGS1

PCI Slot 4

IDE 1

Codec

PCI Slot 5

SYS_FAN1

IDE 2

JBT1

FDD1

PWR_FAN1

JAUDIO1

PCI Slot 6

JFP2

JDB1

CNR

JUSB1 JUSB2

JFP1

845G Max (MS-6580 v1.X) ATX Mainboard
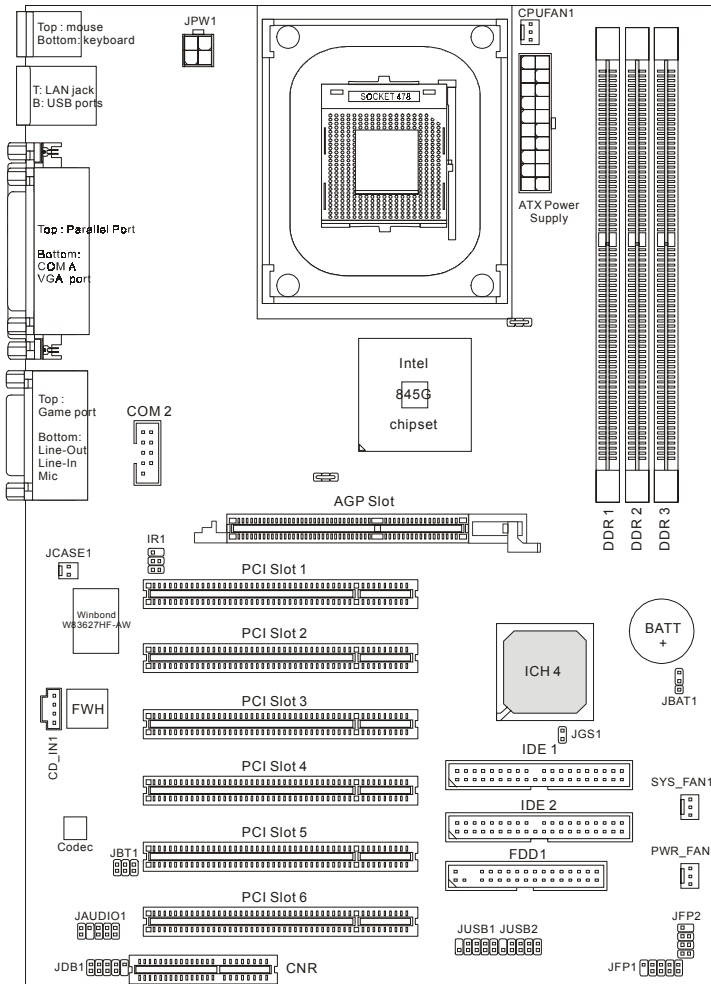
845G Max-L (MS-6580 v1.X) ATX Mainboard

Quick Components Guide

Component	Function	Reference
DDR1~3	Installing DDR SDRAM modules	See p. 2-5~2-6
Socket 478	Installing CPU	See p. 2-2~2-3
CPUFAN1	Connecting to CPUFAN	See p. 2-15
SYS_FAN1	Connecting to SYSTEM FAN	See p. 2-15
PWR_FAN1	Connecting to POWER SUPPLY FAN	See p. 2-15
ATX Power Supply	Installing power supply	See p. 2-7
JPW1	Connecting to 12V power connector	See p. 2-7
IDE1 & IDE2	Connecting to IDE hard disk drive	See p.2-14
FDD1	Connecting to floppy disk drive	See p.2-13
JUSB1/2	Connecting to USB interfaces	See p. 2-19~2-20
PCI Slot 1~6	Installing PCI expansion cards	See p. 2-26
AGP Slot	Installing AGP cards	See p. 2-25
CNR Slot	Installing CNR cards	See p. 2-26
JBAT1	Clearing CMOS data	See p. 2-24
JFP1/2	Connecting to case	See p. 2-17
IR1	Connecting to IR module	See p. 2-16
JAUDIO1	Connecting to audio connector	See p. 2-18
JDB1	Connecting to D-Bracket™	See p. 2-22
COM 2	Connecting to COM port	See p. 2-10
JBT1	Connecting to blue tooth module	See p. 2-16
JDB1	Connecting to D-Bracket™ 2	See p. 2-22
JCASE1	Connecting to chassis intrusion switch	See p. 2-23
JGS1	Connecting to power saving switch	See p. 2-23
CD_IN1	Connecting to CD-ROM audio connector	See p. 2-21

MSI Special Features

Fuzzy Logic™4

The *Fuzzy Logic™ 4* utility is a user friendly tool that allows users to view and adjust the current system status. To overclock the CPU FSB (Front Side Bus) frequency under the Windows operating system, click *FSB* and use the right and left arrow keys to select the desired FSB, and then click *Apply* to apply the new setup value. To enable the system running at the specified FSB every time when you click *Turbo*, click *Save* to save the desired FSB first. If you want to know the maximal CPU overclocking value, click *Auto* to start testing. The CPU FSB will automatically increase the testing value until the PC reboots. After rebooting, click *Turbo* to apply the test result. Click *Default* to restore the default values.
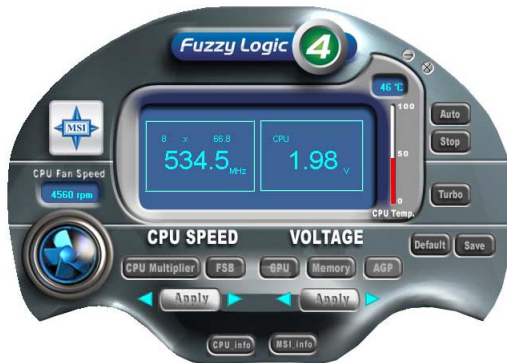
Features:
- MSI Logo   links to the MSI Web site
- CPU Speed   allows users to adjust the CPU speed through CPU Multiplier and FSB
- Voltage   allows user to adjust the voltage of CPU/Memory/AGP
- MSI Info   provides information about the mainboard, BIOS and OS
- CPU Info   provides detailed information about the CPU
- CPU Fan Speed shows the current running speed of CPU Fan
- CPU Temp.   shows the current CPU temperature

*Note: To adjust the options under **CPU Speed** and **Voltage**, use the right and left arrow keys to select the desired value and then click **Apply** to run the setup value.*

Live BIOS™/Live Driver™

The Live BIOS™/Live Driver™ is a tool used to detect and update your BIOS/drivers online so that you don't need to search for the correct BIOS/driver version throughout the whole Web site. To use the function, you need to install the "MSI Live Update Series 2" application. After the installation, the "MSI Live Update Series 2" icon (as shown on the right) will appear on the screen.

Double click the "MSI Live Update Series 2" icon, and the following screen will appear:
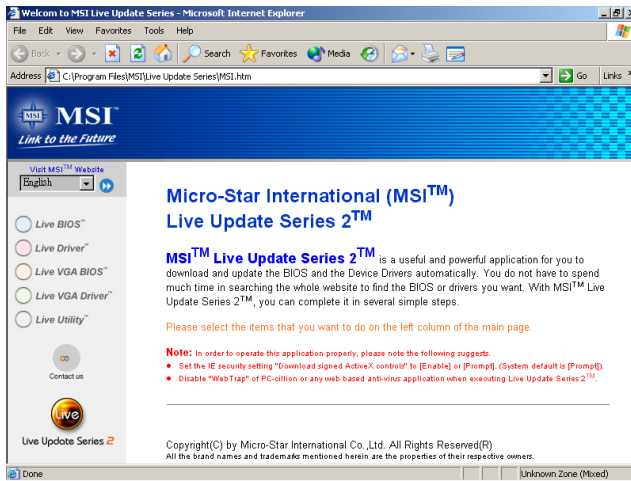
Five buttons are placed on the leftmost pane of the screen. Click the desired button to start the update process.

- **Live BIOS** – Updates the BIOS online.
- **Live Driver** – Updates the drivers online.
- **Live VGA BIOS** – Updates the VGA BIOS online.
- **Live VGA Driver** – Updates the VGA driver online.
- **Live Utility** – Updates the utilities online.

If the product you purchased does not support any of the functions listed above, a "sorry" message is displayed. For more information on the update instructions, insert the companion CD and refer to the "Live Update Series Guide" under the "Manual" Tab.

Live Monitor™

The Live Monitor™ is a tool used to schedule the search for the latest BIOS/drivers version on the MSI Web site. To use the function, you need to install the "MSI Live Update Series 2" application. After the installation, the "MSI Live Monitor" icon (as shown on the right) will appear on the screen. Double click this icon to run the application.

Double click the "MSI Live Monitor" icon at the lower-right corner of the taskbar, and the following dialog box will appear. You can specify how often the system will automatically search for the BIOS/drivers version, or change the LAN settings right from the dialog box.
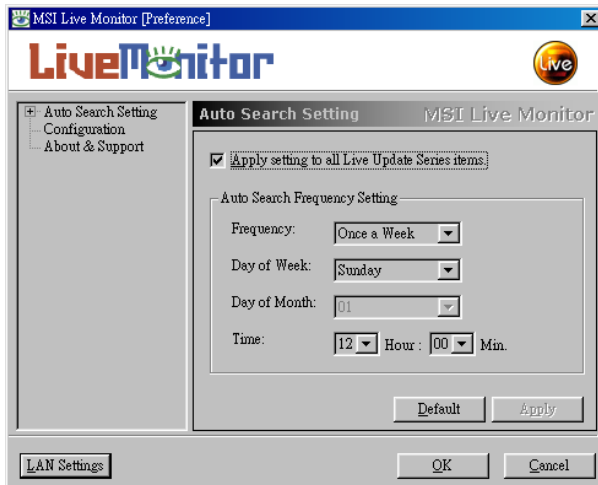
You can right-click the MSI Live Monitor icon to perform the functions listed below:

- **Auto Search** – Searches for the BIOS/drivers version you need immediately.
- **View Last Result** – Allows you to view the last search result if there is any.
- **Preference** – Configures the Search function, including the Search schedule.
- **Exit** – Exits the Live Monitor™ application.

D-Bracket™ 2 (Optional)
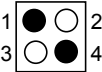
D-Bracket™ 2 is a USB bracket integrating four Diagnostic LEDs, which use graphic signal display to help users understand their system. The LEDs provide up to 16 combinations of signals to debug the system. The 4 LEDs can detect all problems that fail the system, such as VGA, RAM or other failures. This special feature is very useful for overclocking users. These users can use the feature to detect if there are any problems or failures.

D-Bracket™ 2 supports both USB 1.1 & 2.0 spec.
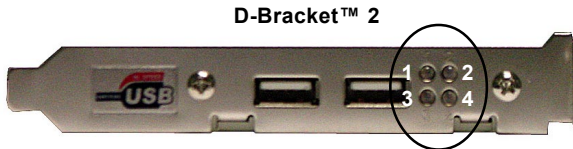
D-Bracket™ 2

● **Red**   ○ **Green**

D-Bracket™ 2	Description
1 ●● 2 3 ●● 4	System Power ON - The D-LED will hang here if the processor is damaged or not installed properly.
○● ●●	Early Chipset Initialization
●○ ●●	Memory Detection Test - Testing onboard memory size. The D-LED will hang if the memory module is damaged or not installed properly.
○○ ●●	Decompressing BIOS image to RAM for fast booting.
●● ○●	Initializing Keyboard Controller.
○● ○●	Testing VGA BIOS - This will start writing VGA sign-on message to the screen.

D-Bracket™ 2	Description
1 ● ○ 2 3 ○ ● 4	Processor Initialization - This will show information regarding the processor (like brand name, system bus, etc…)
○ ○ ○ ●	Testing RTC (Real Time Clock)
● ● ● ○	Initializing Video Interface - This will start detecting CPU clock, checking type of video onboard. Then, detect and initialize the video adapter.
○ ● ● ○	BIOS Sign On - This will start showing information about logo, processor brand name, etc….
● ○ ● ○	Testing Base and Extended Memory - Testing base memory from 240K to 640K and extended memory above 1MB using various patterns.
○ ○ ● ○	Assign Resources to all ISA.
● ● ○ ○	Initializing Hard Drive Controller - This will initialize IDE drive and controller.
○ ● ○ ○	Initializing Floppy Drive Controller - This will initializing Floppy Drive and controller.
● ○ ○ ○	Boot Attempt - This will set low stack and boot via INT 19h.
○ ○ ○ ○	Operating System Booting

Hardware Setup *2*

This chapter provides you with the information about hardware setup procedures. While doing the installation, be careful in holding the components and follow the installation procedures. For some components, if you install in the wrong orientation, the components will not work properly.

Use a grounded wrist strap before handling computer components. Static electricity may damage the components.

Central Processing Unit: CPU

The mainboard supports Intel® Pentium® 4 processor in the 478 pin package. The mainboard uses a CPU socket called PGA478 for easy CPU installation. When you are installing the CPU, **make sure the CPU has a heat sink and a cooling fan attached on the top to prevent overheating.** If you do not find the heat sink and cooling fan, contact your dealer to purchase and install them before turning on the computer.

CPU Installation Procedures

1. Pull the lever sideways away from the socket. Then, raise the lever up to a 90-degree angle.

Open Lever

Sliding Plate

2. Look for the gold arrow. The gold arrow should point towards the lever pivot. The CPU will only fit in the correct orientation.

Gold Arrow

Dot

3. Hold the CPU down firmly, and then close the lever to complete the installation.

Close Lever
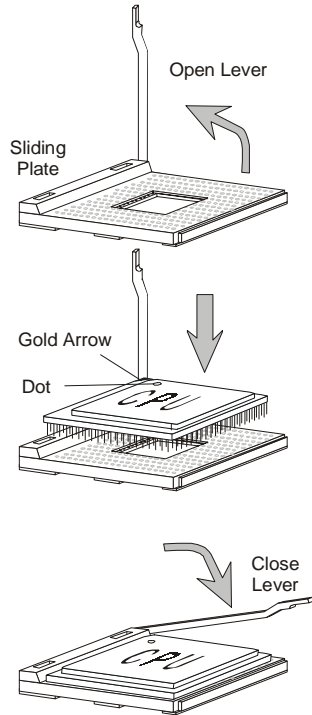
> **STOP**
> **WARNING!**
> *Overheating will seriously damage the CPU and system, always make sure the cooling fan can work properly to protect the CPU from overheating.*

Installing the CPU Fan

As processor technology pushes to faster speeds and higher performance, thermal management becomes increasingly important. To dissipate heat, you need to attach the CPU cooling fan and heatsink on top of the CPU. Follow the instructions below to install the Heatsink/Fan:

1. Locate the CPU and its retention mechanism on the motherboard.

retention mechanism

2. Position the heatsink onto the retention mechanism.
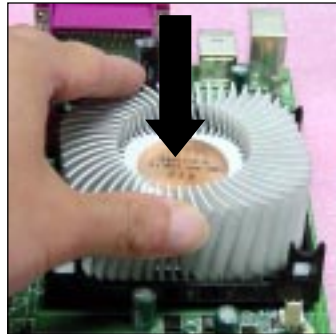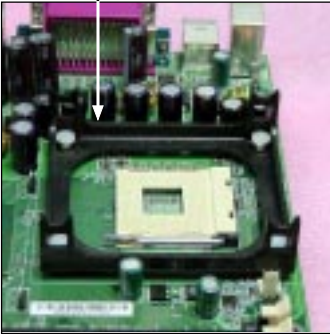
3. Mount the fan on top of the heatsink. Press down the fan until its four clips get wedged in the holes of the retention mechanism.

4. Press the two levers down to fasten the fan. Each lever can be pressed down in only ONE direction.

levers
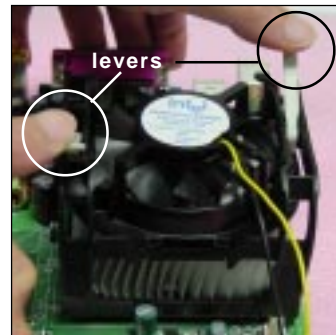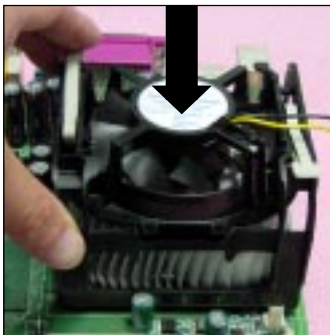
5. Connect the fan power cable from the mounted fan to the 3-pin fan power connector on the board.

fan power cable
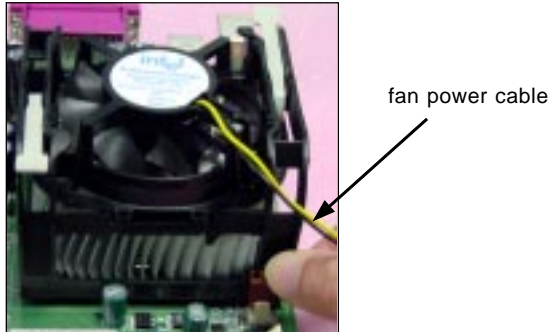
CPU Core Speed Derivation Procedure

If	CPU Clock	=	100MHz
	Core/Bus ratio	=	14
then	CPU core speed	=	Host Clock x Core/Bus ratio
		=	100MHz x 14
		=	1.4GHz

STOP
WARNING!

Overclocking
*This motherboard is designed to support overclocking. However, please make sure your components are able to tolerate such abnormal setting, while doing overclocking. Any attempt to operate beyond product specifications is not recommended. **We do not guarantee the damages or risks caused by inadequate operation or beyond product specifications.***

Memory

The mainboard provides 3 sockets for 184-pin DDR SDRAM DIMM (Double In-Line Memory Module) modules and supports the memory size up to 2GB. You can install PC2100/DDR266 or PC1600/DDR200 DRAM modules on the DDR DIMM slots (DIMM 1~3).
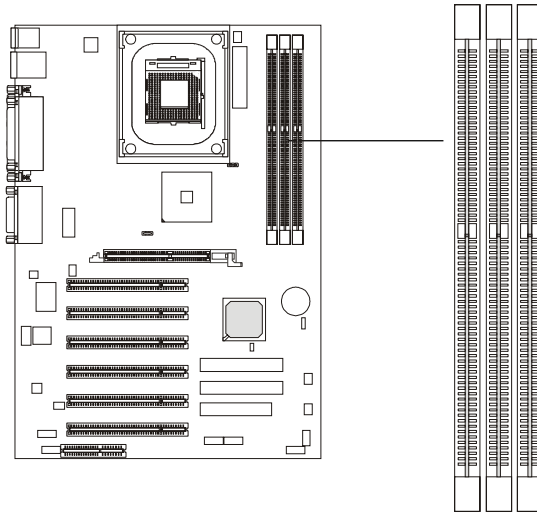
DDR DIMM Slots
(DIMM 1~3)

Introduction to DDR SDRAM

DDR (Double Data Rate) SDRAM is similar to conventional SDRAM, but doubles the rate by transferring data twice per cycle. It uses 2.5 volts as opposed to 3.3 volts used in SDR SDRAM, and requires 184-pin DIMM modules rather than 168-pin DIMM modules used by SDR SDRAM. High memory bandwidth makes DDR an ideal solution for high performance PC, workstations and servers.

DIMM Module Combination

Install at least one DIMM module on the slots. You can install either single- or double-sided modules to meet your own needs.

Intel® 82845G chipset supports a maximum of 4 memory banks. DIMM 1 alone occupies two memory banks; **the other two banks are shared by DIMM 2 & DIMM 3**. Therefore, you must follow the table below to install memory modules:

Slot	Combination				
	1	**2**	**3**	**4**	**5**
DIMM 1	S/D	S/D	S/D	S/D	S/D
DIMM 2	D		S		S
DIMM 3		D		S	S
Total Memory	64MB ~ 2GB				

S: Single Side   D: Double Side

Installing DIMM Modules

The DDR DIMM has only one notch on the center of the module. The module will only fit in the right orientation.

1. Insert the DIMM memory module vertically into the DIMM slot. Then push it in.

Volt   notch
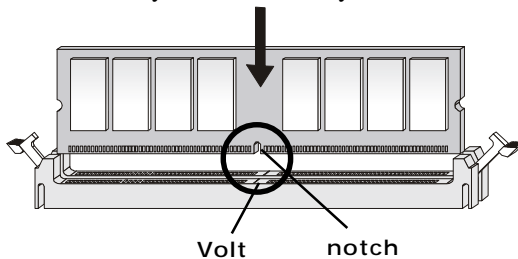
2. The plastic clip at each side of the DIMM slot will automatically close.
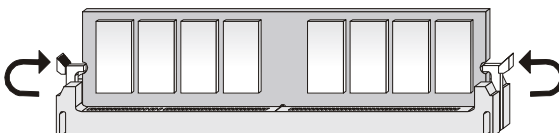
Power Supply

The mainboard supports ATX power supply for the power system. Before inserting the power supply connector, always make sure that all components are installed properly to ensure that no damage will be caused.

ATX 20-Pin Power Connector: PWR1

This connector allows you to connect to an ATX power supply. To connect to the ATX power supply, make sure the plug of the power supply is inserted in the proper orientation and the pins are aligned. Then push down the power supply firmly into the connector.

ATX 12V Power Connector: JPW1

This 12V power connector is used to provide power to the CPU.

PWR1 Pin Definition

PIN	SIGNAL	PIN	SIGNAL
1	3.3V	11	3.3V
2	3.3V	12	-12V
3	GND	13	GND
4	5V	14	PS_ON
5	GND	15	GND
6	5V	16	GND
7	GND	17	GND
8	PW_OK	18	-5V
9	5V_SB	19	5V
10	12V	20	5V
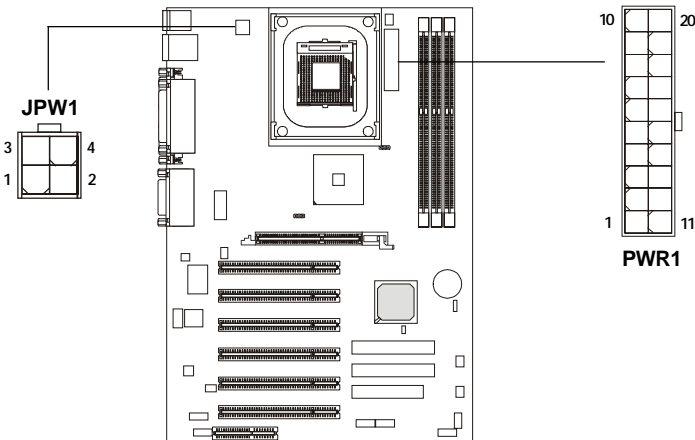
JPW1 Pin Definition

PIN	SIGNAL
1	GND
2	GND
3	12V
4	12V

Back Panel

The Back Panel provides the following connectors:
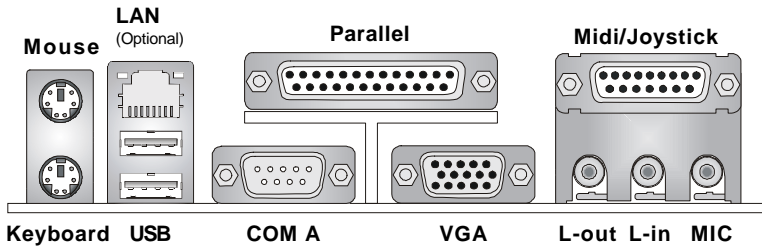
Mouse Connector

The mainboard provides a standard PS/2® mouse mini DIN connector for attaching a PS/2® mouse. You can plug a PS/2® mouse directly into this connector. The connector location and pin assignments are as follows:
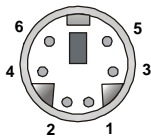
Pin Definition

PIN	SIGNAL	DESCRIPTION
1	Mouse DATA	Mouse DATA
2	NC	No connection
3	GND	Ground
4	VCC	+5V
5	Mouse Clock	Mouse clock
6	NC	No connection

PS/2 Mouse (6-pin Female)

Keyboard Connector

The mainboard provides a standard PS/2® keyboard mini DIN connector for attaching a PS/2® keyboard. You can plug a PS/2® keyboard directly into this connector.
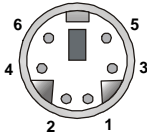
Pin Definition

PS/2 Keyboard (6-pin Female)

PIN	SIGNAL	DESCRIPTION
1	Keyboard DATA	Keyboard DATA
2	NC	No connection
3	GND	Ground
4	VCC	+5V
5	Keyboard Clock	Keyboard clock
6	NC	No connection

USB Connectors

The mainboard provides a UHCI (Universal Host Controller Interface) Universal Serial Bus root for attaching USB devices such as keyboard, mouse or other USB-compatible devices. You can plug the USB device directly into the connector.

USB Port Description
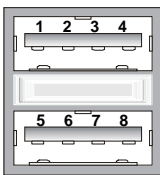
USB Ports

PIN	SIGNAL	DESCRIPTION
1	VCC	+5V
2	-Data 0	Negative Data Channel 0
3	+Data0	Positive Data Channel 0
4	GND	Ground
5	VCC	+5V
6	-Data 1	Negative Data Channel 1
7	+Data 1	Positive Data Channel 1
8	GND	Ground

Serial Port Connectors: COM A & COM B

The mainboard offers two 9-pin male DIN connectors as serial port COM A & COM B (COM B is the header *COM2* on the board). The ports are 16550A high speed communication ports that send/receive 16 bytes FIFOs. You can attach a serial mouse or other serial devices directly to the connectors.
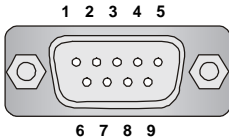
9-Pin Male DIN Connector
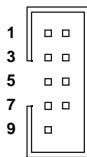
COM2 (COM B)

Pin Definition

PIN	SIGNAL	DESCRIPTION
1	DCD	Data Carry Detect
2	SIN	Serial In or Receive Data
3	SOUT	Serial Out or Transmit Data
4	DTR	Data Terminal Ready)
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicate

VGA DB 15-Pin Connector

One DB 15-pin VGA connector is supplied for connection to a VGA monitor.
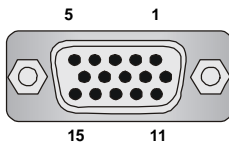
DB 15-Pin Female Connector

Pin Definition

Analog Video Display Connector (DB-15S)	
PIN	SIGNAL DESCRIPTION
1	Red
2	Green
3	Blue
4	Not used
5	Ground
6	Ground
7	Ground
8	Ground
9	Power
10	Ground
11	Not used
12	SDA
13	Horizontal Sync
14	Vertical Sync
15	SCL

Parallel Port Connector: LPT1

The mainboard provides a 25-pin female centronic connector as LPT. A parallel port is a standard printer port that supports Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP) mode.
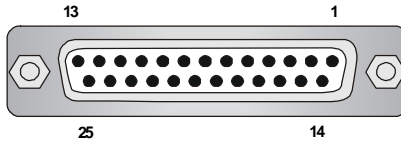
Pin Definition

PIN	SIGNAL	DESCRIPTION
1	STROBE	Strobe
2	DATA0	Data0
3	DATA1	Data1
4	DATA2	Data2
5	DATA3	Data3
6	DATA4	Data4
7	DATA5	Data5
8	DATA6	Data6
9	DATA7	Data7
10	ACK#	Acknowledge
11	BUSY	Busy
12	PE	Paper End
13	SELECT	Select
14	AUTO FEED#	Automatic Feed
15	ERR#	Error
16	INIT#	Initialize Printer
17	SLIN#	Select In
18	GND	Ground
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground

LAN (RJ-45) Jack (845G Max-L only)

The mainboard optionally provides one standard RJ-45 jack for connection to Local Area Network (LAN). You can connect a network cable to the LAN jack.

Pin Definition

RJ-45 LAN Jack
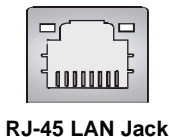
PIN	SIGNAL	DESCRIPTION
1	TDP	Transmit Differential Pair
2	TDN	Transmit Differential Pair
3	RDP	Receive Differential Pair
4	NC	Not Used
5	NC	Not Used
6	RDN	Receive Differential Pair
7	NC	Not Used
8	NC	Not Used

Joystick/Midi Connector

You can connect a joystick or game pad to this connector.
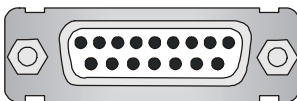
Audio Port Connectors

Line Out is a connector for Speakers or Headphones. **Line In** is used for external CD player, Tape player, or other audio devices. **Mic** is a connector for microphones.

1/8" Stereo Audio Connectors

Line Out   Line In   MIC
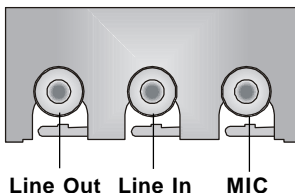
Connectors

The mainboard provides connectors to connect to FDD, IDE HDD, case, USB Ports, IR module, bluetooth module, D-Bracket™ and CPU/System/Power Supply FAN.

Floppy Disk Drive Connector: FDD1

The mainboard provides a standard floppy disk drive connector that supports 360K, 720K, 1.2M, 1.44M and 2.88M floppy disk types.

FDD1
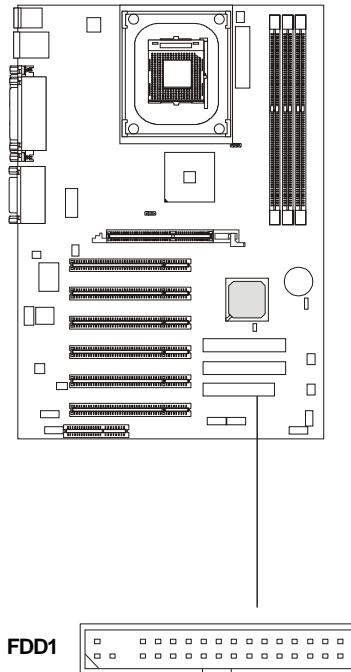
Hard Disk Connectors: IDE1 & IDE2

The mainboard has a 32-bit Enhanced PCI IDE and Ultra DMA 66/100 controller that provides PIO mode 0~5, Bus Master, and Ultra DMA 66/100 function. You can connect up to four hard disk drives, CD-ROM, 120MB Floppy (reserved for future BIOS) and other devices. These connectors support the provided IDE hard disk cable.
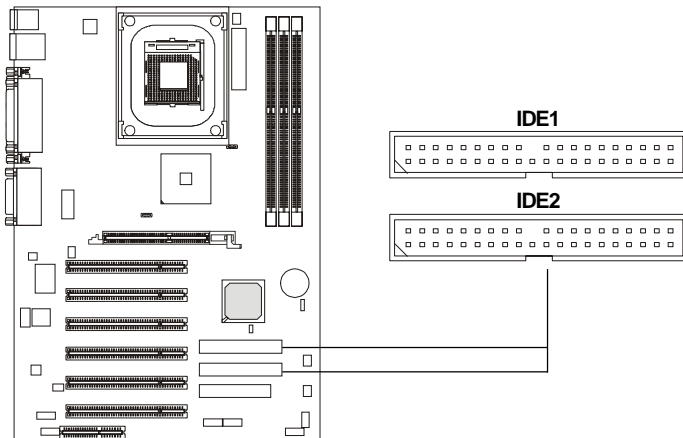
IDE1 (Primary IDE Connector)

The first hard drive should always be connected to IDE1. IDE1 can connect a Master and a Slave drive. You must configure second hard drive to Slave mode by setting the jumper accordingly.

IDE2 (Secondary IDE Connector)

IDE2 can also connect a Master and a Slave drive.

TIP:

If you install two hard disks on cable, you must configure the second drive to Slave mode by setting its jumper. Refer to the hard disk documentation supplied by hard disk vendors for jumper setting instructions.

Fan Power Connectors: CPUFAN1/SYS_FAN1/PWR_FAN1

The CPUFAN1 (processor fan), SYS_FAN1 (system fan) and PWR_FAN1 (power supply fan) support system cooling fan with +12V. It supports three-pin head connector. When connecting the wire to the connectors, always take note that the red wire is the positive and should be connected to the +12V, the black wire is Ground and should be connected to GND. If the mainboard has a System Hardware Monitor chipset on-board, you must use a specially designed fan with speed sensor to take advantage of the CPU fan control.

CPUFAN1
GND
+12V
SENSOR

SYS_FAN1
GND
+12V
SENSOR

PWR_FAN1
GND
+12V
SENSOR
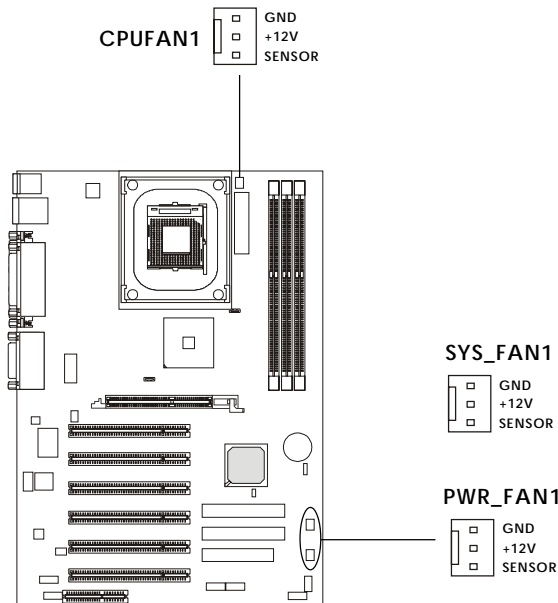
Note:
1. *Always consult the vendor for proper CPU cooling fan.*
2. *CPU Fan supports the fan control. You can install the PC Alert utility that will automatically control the CPU Fan speed according to the actual CPU temperature.*

IrDA Infrared Module Header: IR1

The connector allows you to connect to IrDA Infrared module. You must configure the setting through the BIOS setup to use the IR function. IR1 is compliant with Intel® Front Panel I/O Connectivity Design Guide.

IR1 Pin Definition

Pin	Signal
1	NC
2	NC
3	VCC5
4	GND
5	IRTX
6	IRRX

IR1
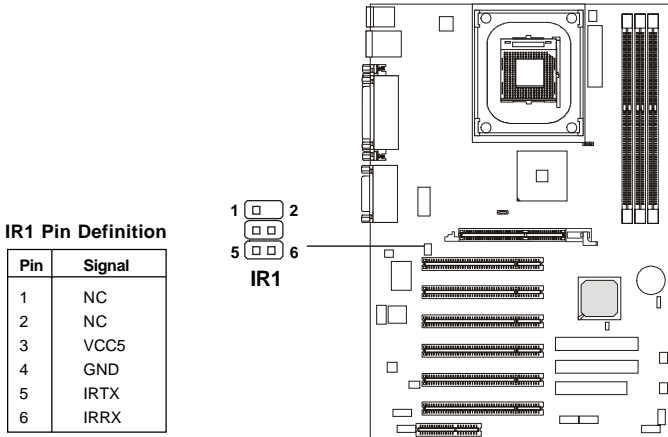
Bluetooth Connector: JBT1

This connector is used to connect a bluetooth module for wireless connection.

JBT1 Pin Definition

PIN	SIGNAL	PIN	SIGNAL
1	VCC5	2	3VDUAL
3	D+ (USB signal)	4	GND
5	D- (USB signal)	6	GND

JBT1
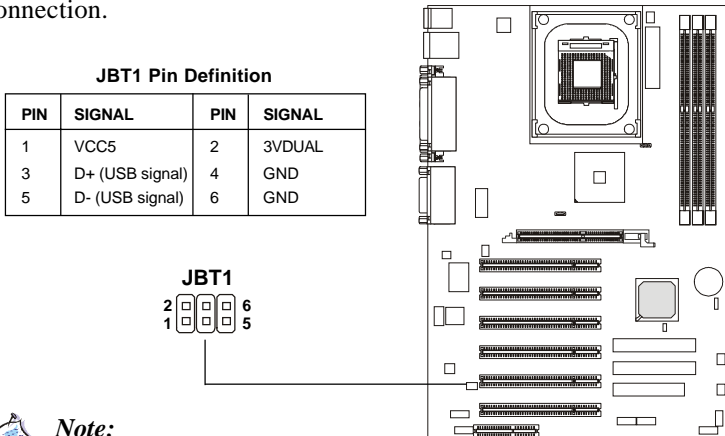
Note:

Because the bluetooth connector shares the USB interface with blue-colored USB2.0 connector, the bottommost USB2.0 port will not function when you attach a bluetooth module to this connector.

Front Panel Connectors: JFP1 & JFP2

The mainboard provides two front panel connectors for electrical connection to the front panel switches and LEDs. JFP1 is compliant with Intel® Front Panel I/O Connectivity Design Guide.
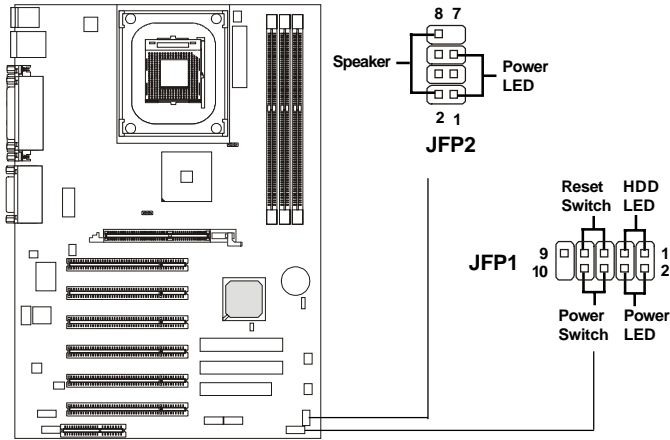
JFP1 Pin Definition

PIN	SIGNAL	DESCRIPTION
1	HD_LED_P	Hard disk LED pull-up
2	FP PWR/SLP	MSG LED pull-up
3	HD_LED_N	Hard disk active LED
4	FP PWR/SLP	MSG LED pull-up
5	RST_SW_N	Reset Switch low reference pull-down to GND
6	PWR_SW_P	Power Switch high reference pull-up
7	RST_SW_P	Reset Switch high reference pull-up
8	PWR_SW_N	Power Switch low reference pull-down to GND
9	RSVD_DNU	Reserved. Do not use.

JFP2 Pin Definition

PIN	SIGNAL	PIN	SIGNAL
1	GND	2	SPK-
3	SLED	4	BUZ+
5	PLED	6	BUZ-
7	NC	8	SPK+

2-17

Front Panel Audio Connector: JAUDIO1

The JAUDIO1 front panel audio connector allows you to connect to the front panel audio and is compliant with Intel® Front Panel I/O Connectivity Design Guide.
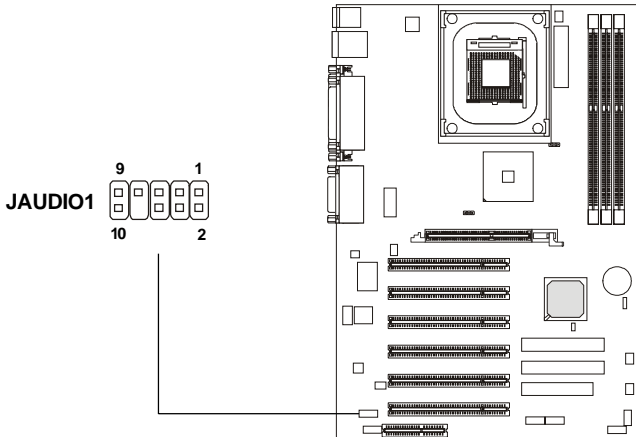
Pin Definition

PIN	SIGNAL	DESCRIPTION
1	AUD_MIC	Front panel microphone input signal
2	AUD_GND	Ground used by analog audio circuits
3	AUD_MIC_BIAS	Microphone power
4	AUD_VCC	Filtered +5V used by analog audio circuits
5	AUD_FPOUT_R	Right channel audio signal to front panel
6	AUD_RET_R	Right channel audio signal return from front panel
7	HP_ON	Reserved for future use to control headphone amplifier
8	KEY	No pin
9	AUD_FPOUT_L	Left channel audio signal to front panel
10	AUD_RET_L	Left channel audio signal return from front panel

Note:
If you don't want to connect to the front audio header, pins 5 & 6, 9 & 10 have to be jumpered in order to have signal output directed to the rear audio ports. Otherwise, the Line-Out connector on the back panel will not function.
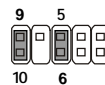
Front USB Connectors: JUSB1/2

The mainboard provides two USB2.0 pinheaders for users to connect to optional USB2.0 ports. These pinheaders are compliant to Intel® I/O Connectivity Design Guide.

USB 2.0 technology increases data transfer rate up to a maximum throughput of 480Mbps, which is 40 times faster than USB 1.1, and is ideal for connecting high-speed USB interface peripherals such as **USB HDD**, **digital cameras**, **MP3 players**, **printers**, **modems and the like**.

JUSB1
(USB 2.0/Intel spec)

JUSB2
(USB 2.0/Intel spec)
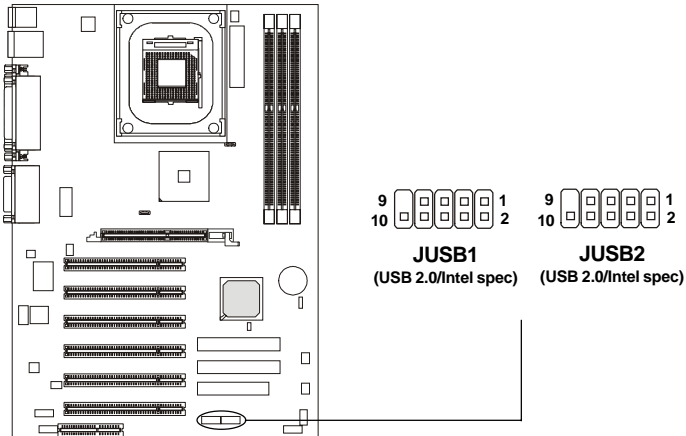
JUSB1/2 Pin Definition

Pin	Description	Pin	Description
1	USBPWR	2	USBPWR
3	USBP2-	4	USBP3-
5	USBP2+	6	USBP3+
7	GND	8	GND
9	NC	10	USBOC

To Attach the Optional USB 2.0 Ports:
1. Take out the USB 2.0 bracket and D-Bracket™ 2 (if there is any).
2. Locate the blue USB pinheader (JUSB2) and yellow USB pinheader (JUSB1) on the motherboard.
3. Connect the USB 2.0 bracket to blue USB pinheader, and D-Bracket™ 2 to yellow USB pinheader.

Connected to JUSB2 (the USB
pinheader in *blue* color)

USB 2.0 Bracket

This USB 2.0 port will not function when a Bluetooth module is connected to the onboard Bluetooth pinheader JBT1. If no Bluetooth function is applied, remove the sticker to utilize this port.

Connected to JDB1

D-Bracket™ 2

Connected to JUSB1 (the USB
pinheader in *yellow* color)

4. Place the USB 2.0 bracket and D-Bracket™ 2 into the appropriate slot of the system case.

> *Note: The USB 2.0 technology is backwards compatible with USB 1.1 spec. To use the USB 2.0 ports, you still need to install USB 2.0 driver, which is supplied by Microsoft for Windows® 2000 and XP. If you have any problems regarding USB 2.0 driver, please visit Microsoft website for more information.*

CD-In Connector: CD_IN1

The connector is for CD-ROM audio connector.

L
GND
R

CD_IN1
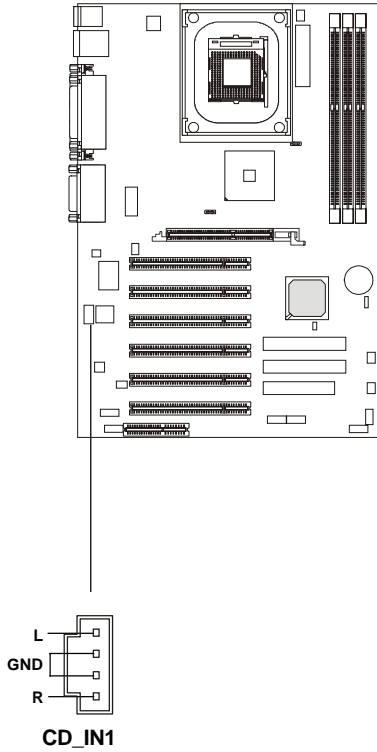
D-Bracket™ 2 Connector: JDB1

The mainboard comes with a JDB1 connector for you to connect to D-Bracket™ 2. D-Bracket™ 2 is a USB Bracket that supports both USB1.1 & 2.0 spec. It integrates four LEDs and allows users to identify system problem through 16 various combinations of LED signals. For definitions of 16 signal combinations, please refer to *D-Bracket™ 2 (Optional)* in *Chapter 1*.

JDB1 Pin Definition

Pin	Signal
1	DBG1 (high for green color)
2	DBR1 (high for red color)
3	DBG2 (high for green color)
4	DBR2 (high for red color)
5	DBG3 (high for green color)
6	DBR3 (high for red color)
7	DBG4 (high for green color)
8	DBR4 (high for red color)
9	Key
10	NC
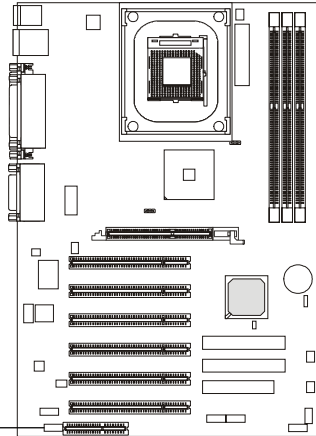
JDB1
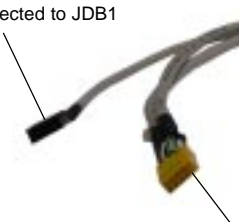
Connected to JDB1

D-Bracket™ 2

Connected to JUSB1 (the USB pinheader in *yellow* color)

LEDs

Chassis Intrusion Switch Connector: JCASE1

This connector is connected to a 2-pin chassis switch. If the chassis is opened, the switch will be short. The system will record this status and show a warning message on the screen. To clear the warning, you must enter the BIOS utility and clear the record.

JCASE1
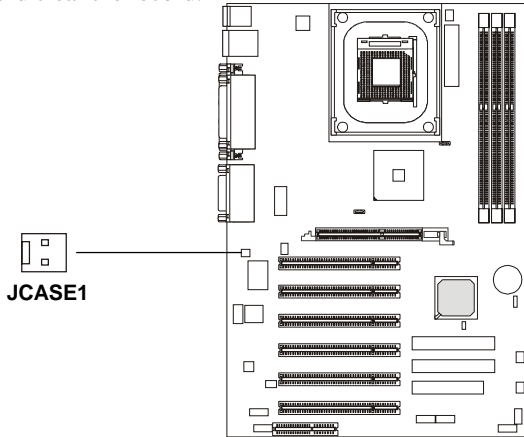
Power Saving Switch Connector: JGS1

Attach a power saving switch to this connector. Pressing the switch once will have the system enter the sleep/suspend state. Press any key to wake up the system.

JGS1
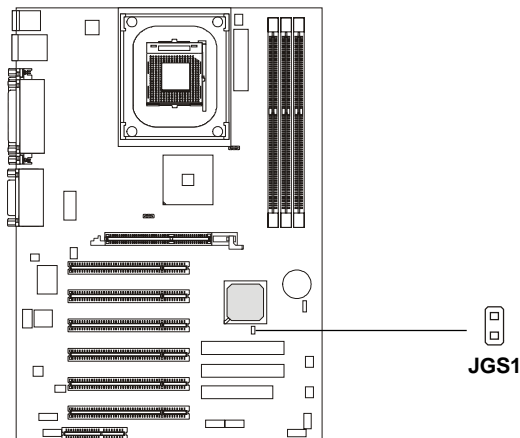
Jumpers

The motherboard provides one jumper for you to set the computer's function. This section will explain how to change your motherboard's function through the use of the jumper.

Clear CMOS Jumper: JBAT1

There is a CMOS RAM on board that has a power supply from external battery to keep the data of system configuration. With the CMOS RAM, the system can automatically boot OS every time it is turned on. If you want to clear the system configuration, use the JBAT1 (Clear CMOS Jumper) to clear data. Follow the instructions below to clear the data:

JBAT1

Keep Data   **Clear Data**
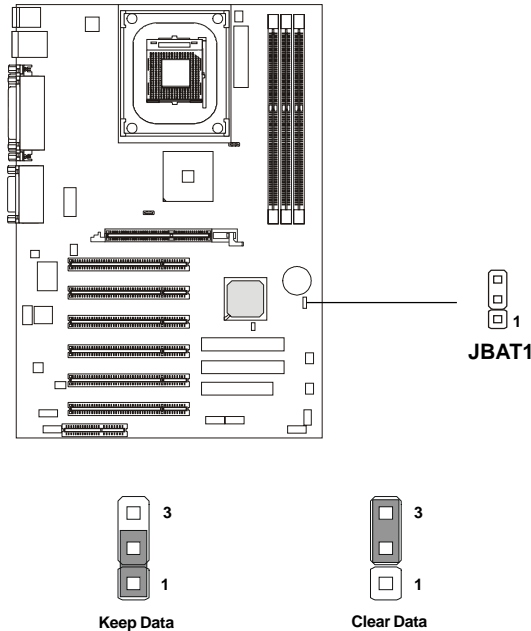
> **STOP**
> **WARNING!**
>
> *You can clear CMOS by shorting 2-3 pin while the system is off. Then return to 1-2 pin position. Avoid clearing the CMOS while the system is on; it will damage the mainboard.*

Slots

The motherboard provides one AGP slot, six 32-bit Master PCI bus slots, and one CNR slot.

AGP Slot

PCI Slots

CNR Slot
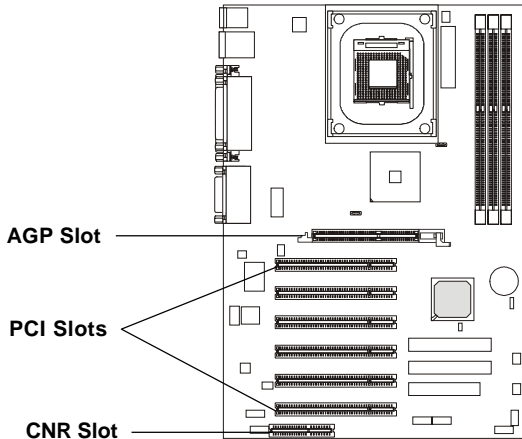
AGP (Accelerated Graphics Port) Slot

The AGP slot allows you to insert the AGP **1.5V** graphics card. AGP is an interface specification designed for the throughput demands of 3D graphics. It introduces a 66MHz, 32-bit channel for the graphics controller to directly access main memory.

Please note that the AGP slot does not support 3.3V AGP card. Use of 3.3V AGP card may cause damages to the mainboard. To avoid the risk of causing permanent damages to the mainboard, the AGP slot is protected with MSI electrical routing device. If users have inserted a 3.3V AGP card into the slot, the MSI routing device will disable the computer's boot-up system. Remove the 3.3V AGP card and the boot-up system will return to normal.

STOP **Attention!**

DO NOT use the following AGP cards which would result in failure to restart the system. The following list is subject to change without prior notice.

Model	AGP Chip
ATI Xpert2000	3D RAGE 128VR
ATI Rage Furry Maxx	3D RAGE 128 Pro
Diamond Monster Fusion	3DFX VooDoo Banshee
Hercules KYRO II 4500	
Leadtek Winfast VR300	SiS300
Matrox Millennium G400	G4+MDHA32G
STB 3Dfx VooDoo3 3500TV	3Dfx VooDoo 3500TV

PCI Slots

Six PCI slots allow you to insert the expansion cards to meet your needs. When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to make any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

CNR (Communication Network Riser) Slot

The CNR slot allows you to insert the CNR expansion cards. CNR is a specially designed network, audio, or modem riser card for ATX family motherboards. Its main processing is done through software and controlled by the motherboard's chipset.

Please note the CNR slot of *845G Max-L* **supports audio and modem only**, so you cannot install a LAN card on the CNR slot. Only the CNR slot of *845G Max* supports network, audio and modem.

PCI Interrupt Request Routing

The IRQ, abbreviation of interrupt request line and pronounced I-R-Q, are hardware lines over which devices can send interrupt signals to the microprocessor. The "AGP/PCI/USB/LAN" IRQ pins are typically connected to the PCI bus INT A# ~ INT H# pins as follows:

	Order 1	Order 2	Order 3	Order 4
AGP	INT A#	INT B#		
PCI Slot 1	INT A#	INT B#	INT C#	INT D#
PCI Slot 2	INT B#	INT C#	INT D#	INT A#
PCI Slot 3	INT C#	INT D#	INT A#	INT B#
PCI Slot 4	INT D#	INT A#	INT B#	INT C#
PCI Slot 5	INT B#	INT C#	INT D#	INT A#
PCI Slot 6	INT A#	INT B#	INT C#	INT D#
USB1.1 Controller 1	INT A#			
USB1.1 Controller 2	INT D#			
USB1.1 Controller 3	INT C#			
USB2.0 Controller	INT H#			
LAN Controller	INT E#			

AGP & PCI Slot 1 & PCI Slot 6 & USB1.1 Controller 1 shared.
PCI Slot 2 & PCI Slot 5 shared.
PCI Slot 3 & USB1.1 Controller 3 shared.
PCI Slot 4 & USB1.1 Controller 2 shared.

PCI Slot 1~6: Bus Master

BIOS Setup 3

This chapter provides information on the BIOS Setup program and allows you to configure the system for optimum use.

You may need to run the Setup program when:
■ An error message appears on the screen during the system booting up, and requests you to run SETUP.
■ You want to change the default settings for customized features.

Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <DEL> key to enter Setup.

DEL:Setup   F12:Network boot   TAB:Logo

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it OFF and On or pressing the RESET button. You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

Control Keys

<↑>	Move to the previous item
<↓>	Move to the next item
<←>	Move to the item in the left hand
<→>	Move to the item in the right hand
<Enter>	Select the item
<Esc>	Jumps to the Exit menu or returns to the main menu from a submenu
<+/PU>	Increase the numeric value or make changes
<-/PD>	Decrease the numeric value or make changes
<F5>	Restore the previous CMOS value from CMOS, only for Option Page Setup Menu
<F6>	Load High Performance Defaults
<F7>	Load BIOS Setup Defaults
<F10>	Save all the CMOS changes and exit

Getting Help

After entering the Setup utility, the first screen you see is the Main Menu.

Main Menu

The main menu displays the setup categories the BIOS supplies. You can use the arrow keys (↑↓) to select the item. The on-line description for the selected setup category is displayed at the bottom of the screen.

Default Settings

The BIOS setup program contains two kinds of default settings: the BIOS Setup and High Performance defaults. BIOS Setup defaults provide stable performance settings for all devices and the system, while High Performance defaults provide the best system performance but may affect the system stability.

The Main Menu

Once you enter AMIBIOS NEW SETUP UTILITY, the Main Menu will appear on the screen. The Main Menu displays twelve configurable functions and two exit choices. Use arrow keys to move among the items and press <Enter> to enter the sub-menu.

```
           AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

  ▶ Standard CMOS Features        ▶ Frequency/Voltage Control

  ▶ Advanced BIOS Features          Set Supervisor Password

  ▶ Advanced Chipset Features       Set User Password

  ▶ Power Management Features        Load High Performance Defaults

  ▶ PNP/PCI Configurations          Load BIOS Setup Defaults

  ▶ Integrated Peripherals          Save & Exit Setup

  ▶ PC Health Status                Exit Without Saving


   F1:Help      ↑↓:Select Item    +/-:Change Values      F7:Setup Defaults
   Esc:Exit     ↔:Select Menu     Enter:Select ▶Sub-Menu  F10:Save & Exit

   Loads Safe values for all the Setup options
```

Standard CMOS Features
Use this menu for basic system configurations, such as time, date etc.

Advanced BIOS Features
Use this menu to setup the items of AMI® special enhanced features.

Advanced Chipset Features
Use this menu to change the values in the chipset registers and optimize your system's performance.

Power Management Features
Use this menu to specify your settings for power management.

PNP/PCI Configurations
This entry appears if your system supports PnP/PCI.

Integrated Peripherals
Use this menu to specify your settings for integrated peripherals.

PC Health Status
This entry shows your PC health status.

Frequency/Voltage Control
Use this menu to specify your settings for frequency/voltage control.

Set Supervisor Password
Use this menu to set Supervisor Password.

Set User Password
Use this menu to set User Password.

Load High Performance Defaults
Use this menu to load the BIOS values for the best system performance, but the system stability may be affected.

Load BIOS Setup Defaults
Use this menu to load factory default settings into the BIOS for stable system performance operations.

Save & Exit Setup
Save changes to CMOS and exit setup.

Exit Without Saving
Abandon all changes and exit setup.

Standard CMOS Features

The items inside STANDARD CMOS FEATURES menu are divided into 9 categories. Each category includes none, one or more setup items. Use the arrow keys to highlight the item you want to modify and use the <PgUp> or <PgDn> keys to switch to the value you prefer.

```
            AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

      Standard CMOS Features              [  Setup Help  ]

   System Date            Mar 25 2002 Mon    Primary IDE Master
   System Time            03:53:42              Configuration

 ▶ Primary IDE Master
 ▶ Primary IDE Slave
 ▶ Secondary IDE Master
 ▶ Secondary IDE Slave

   Floppy Drive A         1.44 MB 3½
   Floppy Drive B         Not Installed

   Boot Sector Virus Protection  Disabled



   F1:Help       ↑↓:Select Item      +/-:Change Values   F7:Setup Defaults
   Esc:Previous Menu                 Enter:Select ▶Sub-Menu   F6:Hi-Performance
```

System Date
This allows you to set the system to the date that you want (usually the current date). The format is <day><month> <date> <year>.

day	Day of the week, from Sun to Sat, determined by BIOS. Read-only.
month	The month from Jan. through Dec.
date	The date from 1 to 31 can be keyed by numeric function keys.
year	The year can be adjusted by users.

System Time
This allows you to set the system time that you want (usually the current time). The time format is <hour> <minute> <second>.

Primary/Secondary IDE Master/Slave

Press <Enter> to enter the sub-menu screen. When you select a specific hard disk drive type, the specification of hard disk drive will show up on the screen according to your selection.

> Type: Press PgUp/<+> or PgDn/<-> to select the type of the device.

> Cylinders: Select the number of cylinders.

> Heads: Select the number of heads.

> Write Precompensation: Select the write precompensation.

> Sectors: Select the number of sectors.

> Maximum Capacity: Select the capacity of the device.

> LBA Mode: Turn the LBA mode on or off.

> Block Mode: Block mode is also called block transfer, multiple commands, or multiple sector read/write. Select *On* for automatic detection of the optimal number of block read/writes per sector the drive can support

> Fast Programmed I/O Modes: Select a PIO mode (0~5) for each of the IDE devices. Modes 0 through 5 provide successively increased performance.

> 32 Bit Transfer Mode: Performance increases when 32-bit I/O transfers are enabled.

Floppy Drive A/B

This item allows you to set the type of floppy drives installed. Available options: *Not Installed*, *360 KB 5¼*, *1.2 MB 5¼*, *720 KB 3½*, *1.44 MB 3½*, *2.88 MB 3½*.

Boot Sector Virus Protection

The item is to set the Virus Warning feature for IDE Hard Disk boot sector protection. When *Enabled*, BIOS will issue a virus warning message and beep if a write to the boot sector or the partition table of the HDD is attempted. Setting options: *Disabled*, *Enabled*.

> *Note: This feature only protects the boot sector, not the whole hard disk.*

Advanced BIOS Features

```
        AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

    Advanced BIOS Features              [  Setup Help  ]

 Quick Boot                   Enabled
 Full Screen LOGO Show        BIOS
▶ Boot Device Select ...
 S.M.A.R.T. for Hard Disks    Disabled
 BootUp Num-Lock              On
 Swap Floppy                  Disabled
 Seek Floppy                  Disabled
 Password Check               Setup
 Boot OS/2 for DRAM > 64MB    No
 APIC Interrupt Mode          Enabled
 MPS Revision                 1.4
 CPU L1 & L2 Cache            WriteBack
 Flash Protection             Enabled
 System BIOS Cacheable        Enabled
 C000,32k Shadow              Cached


 F1:Help      ↑↓:Select Item    +/-:Change Values    F7:Setup Defaults
 Esc:Previous Menu              Enter:Select ▶Sub-Menu  F6:Hi-Performance
```

Quick Boot

Setting the item to *Enabled* allows the system to boot within 5 seconds since it will skip some check items. Available options: *Enabled*, *Disabled*.

Full Screen LOGO Show

This item enables you to show the company logo on the bootup screen. Settings are:

Silent	Shows a still image (logo) on the full screen at boot.
BIOS	Shows the POST messages at boot.

Boot Device Select

Press <Enter> to enter the sub-menu screen.
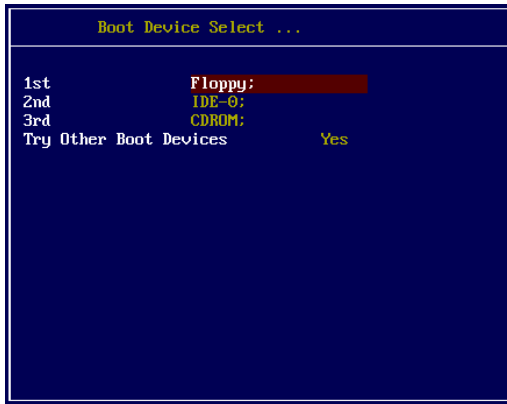
1st/2nd/3rd

The items allow you to set the sequence of boot devices where AMIBIOS attempts to load the operating system. The settings are:

IDE-0	The system will boot from the first HDD.
IDE-1	The system will boot from the second HDD.
IDE-2	The system will boot from the third HDD.
IDE-3	The system will boot from the fourth HDD.
Floppy	The system will boot from floppy drive.
ARMD-FDD	The system will boot from any ARMD device, such as LS-120 or ZIP drive, that functions as a floppy drive.
ARMD-HDD	The system will boot from ARMD device, such as MO or ZIP drive, that functions as hard disk drive.
CDROM	The system will boot from the CD-ROM.
Legacy SCSI	The system will boot from the SCSI.
Legacy NETWORK	The system will boot from the Network drive.
BBS-0	The system will boot from the first BBS (BIOS Boot Specification) compliant device.
BBS-1	The system will boot from the second BBS (BIOS Boot Specification) compliant device.
BBS-2	The system will boot from the third BBS (BIOS Boot Specification) compliant device.
BBS-3	The system will boot from the fourth BBS (BIOS Boot Specification) compliant device.
Disabled	Disable this sequence.

Note: Available settings for "1st/2nd/3rd" boot device vary depend-ing on the bootable devices you have installed. For example, if you did not install a floppy drive, the setting "Floppy" does not show up.

Try Other Boot Devices
Setting the option to *Yes* allows the system to try to boot from other devices if the system fails to boot from the 1st/2nd/3rd boot device.

S.M.A.R.T. for Hard Disks
This allows you to activate the S.M.A.R.T. (Self-Monitoring Analysis & Re-porting Technology) capability for the hard disks. S.M.A.R.T is a utility that monitors your disk status to predict hard disk failure. This gives you an opportunity to move data from a hard disk that is going to fail to a safe place before the hard disk becomes offline. Settings: *Enabled*, *Disabled*.

BootUpNum-Lock
This item is to set the Num Lock status when the system is powered on. Setting to *On* will turn on the Num Lock key when the system is powered on. Setting to *Off* will allow end users to use the arrow keys on the numeric keypad. Setting options: *On*, *Off*.

SwapFloppy
Setting to *Enabled* will swap floppy drives A: and B:.

SeekFloppy
This setting causes the BIOS to search for floppy disk drives at boot time. When enabled, the BIOS will activate the floppy disk drives during the boot process: the drive activity light will come on and the head will move back and forth once. First A: will be done and then B: if it exists. Setting options: *Disabled*, *Enabled*.

Password Check
This specifies the type of AMIBIOS password protection that is implemented. Setting options are described below.

Option	Description
Setup	The password prompt appears only when end users try to run Setup.
Always	A password prompt appears every time when the computer is powered on or when end users try to run Setup.

Boot OS/2 for DRAM > 64MB

This allows you to run the OS/2® operating system with DRAM larger than 64MB. When you choose *No*, you cannot run the OS/2® operating system with DRAM larger than 64MB. But it is possible if you choose *Yes*.

APIC Interrupt Mode

This field is used to enable or disable the APIC (Advanced Programmable Interrupt Controller). Due to compliance to PC2001 design guide, the system is able to run in APIC mode. Enabling APIC mode will expand available IRQs resources for the system. Settings: *Enabled*, *Disabled*.

MPS Revision

This field allows you to select which MPS (Multi-Processor Specification) version to be used for the operating system. You need to select the MPS version supported by your operating system. To find out which version to use, consult the vendor of your operating system. Options: *1.4*, *1.1*.

CPU L1 & L2 Cache

Cache memory is additional memory that is much faster than conventional DRAM (system memory). When the CPU requests data, the system transfers the requested data from the main DRAM into cache memory, for even faster access by the CPU. The setting controls the L1 (also known as level 1 cache) and L2 (also known as level 2 cache). Setting options: *Disabled, WriteBack, WriteThru*. *WriteBack* & *WriteThru* refer to the cache's write policy, which determines how it handles writes to memory locations that are currently being held in cache. The *WriteBack* cache policy will produce the best performance.

Flash Protection

This function protects the BIOS from accidental corruption by unauthorized users or computer viruses. When enabled, the BIOS's data cannot be changed when attempting to update the BIOS with a Flash utility. To successfully update the BIOS, you'll need to disable this BIOS Flash Write Control function. You should enable this function at all times. The only time when you need to disable the function is when you want to update the BIOS. After updating the BIOS, you should immediately re-enable it to protect the BIOS against viruses. Settings: *Enabled*, *Disabled*.

System BIOS Cacheable

Selecting *Enabled* allows caching of the system BIOS ROM at F0000h-FFFFFh, resulting in better system performance. However, if any program writes to this

memory area, a system error may result. Setting options: *Enabled, Disabled*.

C000, 32k Shadow
This item specifies how the contents of the adapter ROM named in the item are handled. Settings are described below:

Option	Description
Disabled	The specified ROM is not copied to RAM.
Enabled	The contents of specified ROM are copied to RAM for faster system performance.
Cached	The contents of specified ROM are not only copied to RAM, the contents of the ROM area can be written to and read from cache memory.

Advanced Chipset Features

```
            AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

      Advanced Chipset Features              [  Setup Help  ]

  ▶ DRAM Timing Setting...
    AGP Aperture Size              64MB
    Internal Graphics Select      8MB
    Display Cache Window Size      128MB
    ******** Display Setting *******
    Boot Display Device           Auto
    TV Standard                   Auto











   F1:Help       ↑↓:Select Item     +/-:Change Values    F7:Setup Defaults
   Esc:Previous Menu                Enter:Select ▶Sub-Menu  F6:Hi-Performance
```
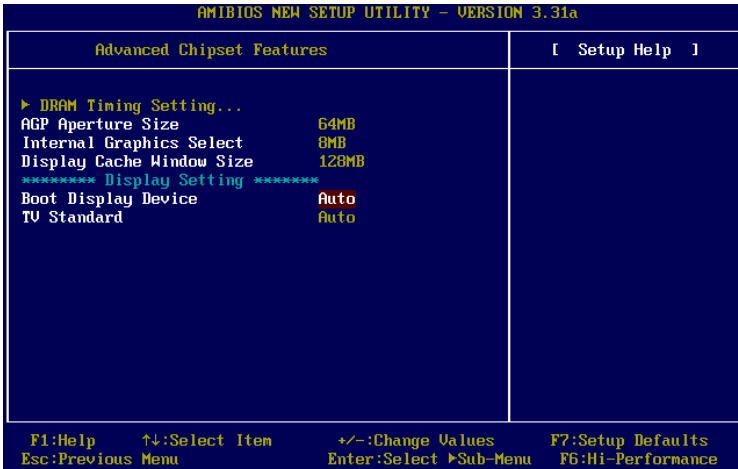
🔎 *Note: Change these settings only if you are familiar with the chipset.*

DRAM Timing Setting

Press <Enter> and the following sub-menu appears.

```
              DRAM Timing Setting...

    DRAM Frequency                 Auto
    Configure DRAM Timing by SPD   Enabled
      CAS# Latency                 2.5 Clocks
      RAS# Precharge               3 Clocks
      RAS# to CAS# Delay           3 Clocks
      Precharge Delay              7 Clocks
      Burst Length                 4
```

DRAM Frequency

Use this item to configure the clock frequency of the installed SDRAM.
Settings options: *Auto*, *200MHz*, *266MHz*, *333MHz*.

3-13

Configure DRAM Timing by SPD

Selects whether DRAM timing is controlled by the SPD (Serial Presence Detect) EEPROM on the DRAM module. Setting to *Enabled* enables CAS# Latency, RAS# Precharge, RAS# to CAS# Delay, Precharge Delay and Burst Length automatically to be determined by BIOS based on the configurations on the SPD. Selecting *Disabled* allows users to configure these fields manually.

CAS# Latency

The field controls the CAS latency, which determines the timing delay before SDRAM starts a read command after receiving it. Setting options: *2 Clocks* and *3 Clocks*. *2 Clocks* increases system performance while *3Clocks* provides more stable system performance.

RAS# Precharge

This item controls the number of cycles for Row Address Strobe (RAS) to be allowed to precharge. If insufficient time is allowed for the RAS to accumulate its charge before DRAM refresh, refresh may be incomplete and DRAM may fail to retain data. This item applies only when synchronous DRAM is installed in the system. Available settings: *2 Clocks*, *3 Clocks*.

RAS# to CAS# Delay

This field allows you to set the number of cycles for a timing delay between the CAS and RAS strobe signals, used when DRAM is written to, read from or refreshed. Fast speed offers faster performance while slow speed offers more stable performance. Settings: *3 Clocks*, *2 Clocks*.

Precharge Delay

The field specifies the idle cycles before precharging an idle bank. Settings: *7 Clocks*, *6 Clocks*, *5 Clocks*.

Burst Length

This setting allows you to set the size of Burst-Length for DRAM. Bursting feature is a technique that DRAM itself predicts the address of the next memory location to be accessed after the first address is accessed. To use the feature, you need to define the burst length, which is the actual length of burst plus the starting address and allows internal address counter to properly generate

the next memory location. The bigger the size, the faster the DRAM performance. Settings: *4*, *8 (QW)*.

AGP Aperture Size
This setting controls just how much system RAM can be allocated to AGP for video purposes. The aperture is a portion of the PCI memory address range dedicated to graphics memory address space. Host cycles that hit the aperture range are forwarded to the AGP without any translation. The option allows the selection of an aperture size of *4MB, 8MB, 16MB, 32MB, 64MB, 128MB, and 256 MB*.

Internal Graphics Select
The field specifies the size of system memory allocated for video memory. Settings: *512KB*, *1MB*, *8MB*, *Disabled*.

Display Cache Window Size
This setting controls just how much system RAM can be allocated to onboard video controller for video purposes. The display cache window is a portion of the PCI memory address range dedicated to graphics memory address space. Host cycles that hit the aperture range are forwarded to the onboard video device without any translation. Settings: *64MB*, *128MB*.

***** Display Setting *****
Boot Display Device
Use the field to select the type of device you want to use as the display(s) of the system. Setting options: *Auto*, *CRT*, *TV*, *EFP*, *CRT+EFP*. The option EFP refers to the LCD display.

TV Standard
Select the TV standard which is used as the video signal format of your TV if you have connected a TV to the system. Three TV standards are available for the field:

PAL	PAL format. This is a dominant standard in Europe.
NTSC	NTSC format. This format is used by many American and Asian countries including US and Japan.
SECAM	SECAM format. The format is implemented in some countries like France.

Power Management Features

```
         AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

      Power Management Features                    [  Setup Help  ]

  IPCA Function                      Yes
  ACPI Standby State                 S1/POS
  Re-Call VGA BIOS at S3 Resuming    Disabled
  Power Management/APM               Enabled
  Suspend Time Out (Minute)          Disabled
  Power Button Function              On/Off
  Restore on AC/Power Loss           Last State
  ▶ Set Monitor Events ...
  ▶ Set Wake Up Events ...




   F1:Help       ↑↓:Select Item     +/-:Change Values    F7:Setup Defaults
   Esc:Previous Menu                Enter:Select ▶Sub-Menu  F6:Hi-Performance
```

IPCA Function

This item is to activate the ACPI (Advanced Configuration and Power Management Interface) function. If your operating system is ACPI-aware, such as Windows 98SE/2000/ME, select *Yes*. Available options: *Yes*, *No*.

ACPI Standby State

This item specifies the power saving modes for ACPI function. Options are:

S1/POS	The S1 sleep mode is a low power state. In this state, no system context is lost (CPU or chipset) and hardware maintains all system context.
S3/STR	The S3 sleep mode is a lower power state where the information of system configuration and open applications/files is saved to main memory that remains powered while most other hardware components turn off to save energy. The information stored in memory will be used to restore the system when a "wake up" event occurs.
Auto	OS driver determines the best mode for ACPI standby state.

Re-Call VGA BIOS at S3 Resuming

Selecting *Enabled* allows BIOS to call VGA BIOS to initialize the VGA card when system wakes up (resume) from S3 sleep state. The system resume time is shortened when you disable the function, but system will need an AGP driver to initialize the VGA card. Therefore, if the AGP driver of the card does not support the initialization feature, the display may work abnormally or not function after resuming from S3.

Power Management/APM

Setting to *Enabled* will activate an Advanced Power Management (APM) device to enhance Max Saving mode and stop CPU internal clock. Settings: *Disabled*, *Enabled*.

Suspend Time Out

After the selected period of system inactivity, all devices except the CPU shut off. Settings: *Disabled, 1, 2, 4, 8, 10, 20, 30, 40, 50, 60 (minutes).*

Power Button Function

This feature sets the function of the power button. Settings are:

On/Off	The power button functions as normal power off button.
Suspend	When you press the power button, the computer enters the suspend/sleep mode, but if the button is pressed for more than four seconds, the computer is turned off.

Restore On AC/Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

Power Off	Leaves the computer in the power off state.
Power On	Reboots the computer.
Last State	Restores the system to the status before power failure or interrupt occurred.

Set Monitor Events

Press <Enter> to enter the sub-menu and the following screen appears:

```
        Set Monitor Events ...

FDC/LPT/COM Ports              Monitor
Primary Master IDE             Monitor
Primary Slave IDE              Ignore
Secondary Master IDE           Monitor
Secondary Slave IDE            Ignore
```
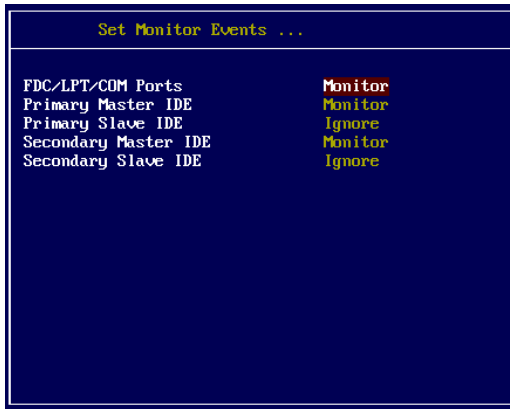
FDC/LPT/COM Ports, Primary/Secondary Master/Slave IDE

These fields specify whether the system will be awakened from power saving modes when activity or input signal of the specified hardware peripheral or component is detected.

Set Wake Up Events

Press <Enter> to enter the sub-menu and the following screen appears:

```
       Set Wake Up Events ...

Keyboard PowerOn Function      Disabled
 Specific Key for PowerOn      N/A
Mouse PowerOn Function         Disabled
Resume On Ring                 Enabled
Resume On PME#                 Enabled
Resume On RTC Alarm            Disabled
 RTC Alarm Date                15
 RTC Alarm Hour                12
 RTC Alarm Minute              30
 RTC Alarm Second              30
USB Wakeup From S3             Disabled
```
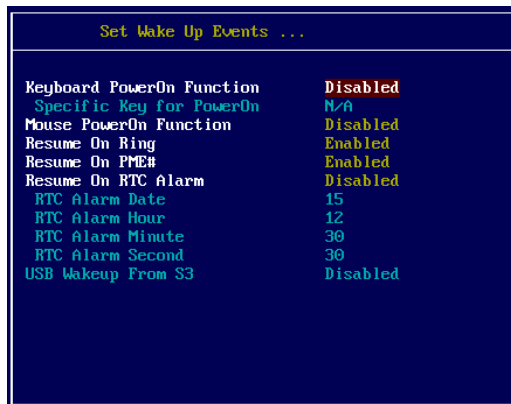
Keyboard/Mouse PowerOn Function, Specific Key for PowerOn, Resume On Ring/PME#, USB Wakeup From S3

These fields specify whether the system will be awakened from power saving modes when activity or input signal of the specified hardware

3-18

peripheral or component is detected.

> *Note:*
> *1. You need to install a modem card supporting power on function for "Resume On Ring" function.*
> *2. For "Keyboard PowerOn Function", the option "Specific Key" refers to the password you specify in the "Specific Key for PowerOn" field. You must type the password to power on the system since the power switch will not function any more after "Specific Key" is selected.*
> *3. For "Mouse PowerOn Function", you need to DOUBLE click the mouse to power on the system if the function is enabled.*

Resume On RTC Alarm

This is used to enable or disable the feature of booting up the system on a scheduled time/date from the soft off (S5) state. Settings: *Enabled*, *Disabled*.

RTC Alarm Date/Hour/Minute/Second

If *Resume On RTC Alarm* is set to *Enabled*, the system will automatically resume (boot up) on a specific date/hour/minute/second specified in these fields. Available settings for each item are:

Alarm Date	*01 ~ 31*, *Every Day*
Alarm Hour	*00 ~ 23*
Alarm Minute	*00 ~ 59*
Alarm Second	*00 ~ 59*

PNP/PCI Configurations

This section describes configuring the PCI bus system and PnP (Plug & Play) feature. PCI, or **P**eripheral **C**omponent **I**nterconnect, is a system which allows I/O devices to operate at speeds nearing the speed the CPU itself uses when communicating with its special components. This section covers some very technical items and it is strongly recommended that only experienced users should make any changes to the default settings.

```
                AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

        PNP/PCI Configurations                    [  Setup Help  ]

  Clear NVRAM                        No
  PCI Latency Timer (PCI Clocks)     32
  Init. Graphics Adapter Priority    AGP/Int-VGA
  PCI IDE BusMaster                  Disabled
  PCI Slot1/6  IRQ Priority          Auto
  PCI Slot2/5  IRQ Priority          Auto
  PCI Slot3    IRQ Priority          Auto
  PCI Slot4    IRQ Priority          Auto
  ▶ Set IRQs to PCI or ISA
  ▶ Set DMAs to PnP or ISA




  F1:Help          ↑↓:Select Item    +/-:Change Values    F7:Setup Defaults
  Esc:Previous Menu                  Enter:Select ▶Sub-Menu  F6:Hi-Performance
```

Clear NVRAM
The ESCD (Extended System Configuration Data) NVRAM (Non-volatile Random Access Memory) is where the BIOS stores resource information for both PNP and non-PNP devices in a bit string format. When the item is set to *Yes*, the system will reset ESCD NVRAM right after the system is booted up and then set the setting of the item back to *No* automatically.

PCI Latency Timer (PCI Clocks)
This item controls how long each PCI device can hold the bus before another takes over. When set to higher values, every PCI device can conduct transactions for a longer time and thus improve the effective PCI bandwidth. For better PCI performance, you should set the item to higher values. Settings range from *32* to *248* at a 32 increment.

Init. Graphics Adapter Priority
This item specifies which VGA device is your primary graphics adapter. Set-

tings are:

Internal VGA	The system initializes the onboard VGA device.
AGP/Int-VGA	The system initializes the installed AGP card first. If an AGP card is not available, it will initialize the onboard VGA device.
AGP/PCI	The system initializes the installed AGP card first. If an AGP card is not available, it will initialize the PCI VGA card.
PCI/AGP	The system initializes the installed PCI VGA card first. If a PCI VGA card is not available, it will initialize the AGP card.
PCI/Int-VGA	The system initializes the installed PCI VGA card first. If a PCI VGA card is not available, it will initialize the onboard VGA device.

PCI IDE BusMaster

Set this option to *Enabled* to specify that the IDE controller on the PCI local bus has bus mastering capability. Settings options: *Disabled*, *Enabled*.

PCI Slot1/6 IRQ Priority, PCI Slot2/5 IRQ Priority, PCI Slot3 IRQ Priority, PCI Slot4 IRQ Priority

These items specify the IRQ line for each PCI slot. Settings: *3*, *4*, *5*, *7*, *9*, *10*, *11*, *Auto*. Selecting *Auto* allows BIOS to automatically determine the IRQ line for each PCI slot.

Set IRQs to PCI or ISA

Press <Enter> to enter the sub-menu and the following screen appears:

```
        Set IRQs to PCI or ISA


   IRQ3                      PCI/PnP
   IRQ4                      PCI/PnP
   IRQ5                      ISA/EISA
   IRQ7                      PCI/PnP
   IRQ9                      PCI/PnP
   IRQ10                     PCI/PnP
   IRQ11                     PCI/PnP
   IRQ14                     PCI/PnP
   IRQ15                     PCI/PnP
```
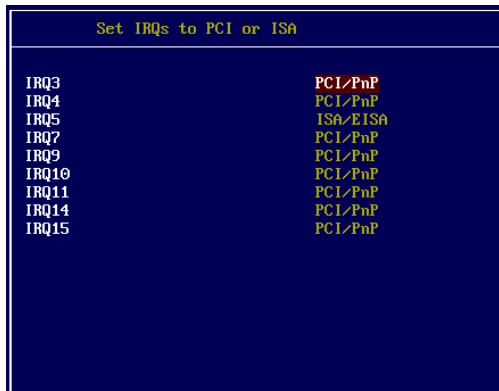
IRQ 3/4/5/7/9/10/11/14/15

These items specify the bus where the specified IRQ line is used.

The settings determine if AMIBIOS should remove an IRQ from the pool of available IRQs passed to devices that are configurable by the system BIOS. The available IRQ pool is determined by reading the ESCD NVRAM. If more IRQs must be removed from the IRQ pool, the end user can use these settings to reserve the IRQ by assigning an *ISA/EISA* setting to it. Onboard I/O is configured by AMIBIOS. All IRQs used by onboard I/O are configured as *PCI/PnP*. If all IRQs are set to ISA/EISA, and IRQ 14/15 are allocated to the onboard PCI IDE, IRQ 9 will still be available for PCI and PnP devices. Available settings: *ISA/EISA*, *PCI/PnP*.

Set DMAs to PnP or ISA

Press <Enter> to enter the sub-menu and the following screen appears:
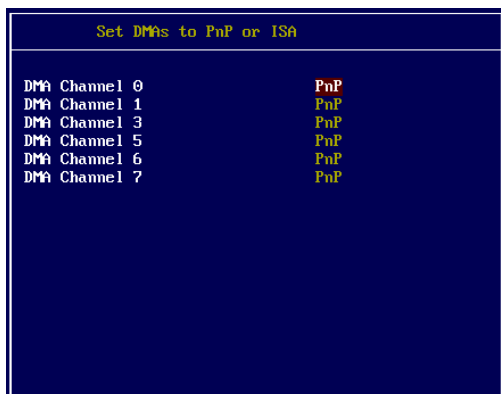
DMA Channel 0/1/3/5/6/7

These items specify the bus that the system DMA (Direct Memory Access) channel is used.

The settings determine if AMIBIOS should remove a DMA from the available DMAs passed to devices that are configurable by the system BIOS. The available DMA pool is determined by reading the ESCD NVRAM. If more DMAs must be removed from the pool, the end user can reserve the DMA by assigning an *ISA/EISA* setting to it.

Integrated Peripherals

```
                    AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

         Integrated Peripherals                    [  Setup Help  ]

   USB Controller             6 USB Ports
   USB 1.1 Legacy Support     Disabled
   On-Chip IDE                Both
   OnChip LAN                 Enabled
   AC'97 Audio                Auto
   AC'97 Modem                Auto
   ▶ Set Super I/O




   F1:Help      ↑↓:Select Item     +/-:Change Values    F7:Setup Defaults
   Esc:Previous Menu               Enter:Select ▶Sub-Menu  F6:Hi-Performance
```
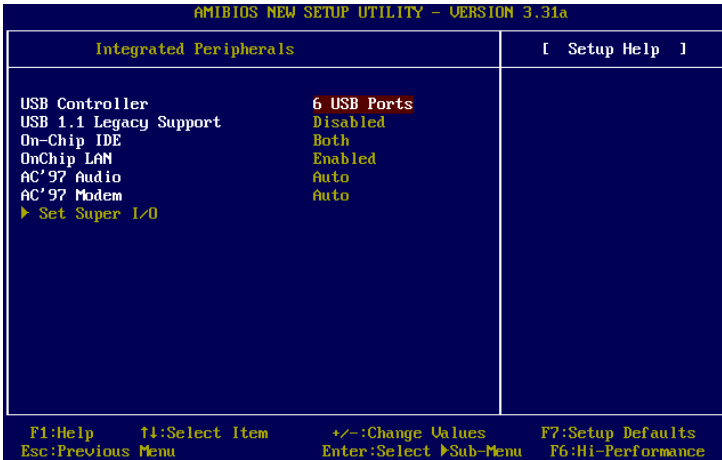
USB Controller
This setting is used to enable/disable the onboard USB controllers. Setting options: *2 USB Ports*, *4 USB Ports, 6 USB Ports, Disabled.*

USB 1.1 Legacy Support
Set to *All Device* if you need to use a USB1.1 device in the operating system that does not support or have any USB driver installed, such as DOS and SCO Unix. Set to *No Mice* if you want to use any USB1.1 device except the mouse. Setting options: *Disabled*, *No Mice*, *All Device*.

On-Chip IDE
This setting controls the on-chip IDE controller. Setting options: *Disabled*, *Primary*, *Secondary, Both*.

OnChip LAN (Optional)
The field determines whether the onboard LAN controller is activated. The field appears only when the mainboard supports the LAN function. Setting options: *Enabled*, *Disabled*.

AC'97 Audio
Auto allows the mainboard to detect whether an audio device is used. If an

audio device is detected, the onboard AC'97 (Audio Codec'97) controller will be enabled; if not, it is disabled. Disable the controller if you want to use other controller cards to connect an audio device. Settings: *Auto, Disabled*.

AC'97 Modem

Auto allows the mainboard to detect whether a modem is used. If a modem is detected, the onboard AC'97 modem controller will be enabled; if not, it is disabled. Disable the controller if you want to use other controller cards to connect a modem. Settings: *Auto*, *Disabled*.

Set Super I/O

Press <Enter> to enter the sub-menu and the following screen appears:

```
              Set Super I/O

OnBoard FDC                      Auto
OnBoard Serial Port A            Auto
OnBoard Serial Port B            Auto
  Serial Port B Mode             Normal
    IR Pin Select                IRRX/IRTX
OnBoard Parallel Port            Auto
  Parallel Port Mode             ECP
  EPP Version                    N/A
  Parallel Port IRQ              Auto
  Parallel Port DMA Channel      Auto
OnBoard Midi Port                Disabled
  Midi IRQ Select                5
OnBoard Game Port                200
```

OnBoard FDC

This is used to enable or disable the onboard Floppy controller.

Option	Description
Auto	BIOS will automatically determine whether to enable the onboard Floppy controller or not.
Enabled	Enables the onboard Floppy controller.
Disabled	Disables the onboard Floppy controller.

OnBoard Serial Port A/B

These items specify the base I/O port addresses of the onboard Serial Port A (COM A)/Serial Port B (COM B). Selecting *Auto* allows AMIBIOS to automatically determine the correct base I/O port address. Settings:

Auto, 3F8/COM1, *2F8/COM2*, *3E8/COM3*, *2E8/COM4*, *Disabled*.

Serial Port B Mode
This item sets the operation mode for Serial Port B. Settings: *Normal*, *1.6 uS, 3/16 Baud* and *ASKIR* (the last three operation modes are setting options for IR function).

IR Pin Select
Set to *IRRX/IRTX* when using an internal IR module connected to the IR header. Set to *SINB/SOUTB*. when connecting an IR adapter to COM B.

OnBoard Parallel Port
This field specifies the base I/O port address of the onboard parallel port. Selecting *Auto* allows AMIBIOS to automatically determine the correct base I/O port address. Settings: *Auto, 378*, *278*, *3BC*, *Disabled*.

Parallel Port Mode
This item selects the operation mode for the onboard parallel port: *ECP*, *Normal*, *Bi-Dir* or *EPP*.

EPP Version
The item selects the EPP version used by the parallel port if the port is set to *EPP* mode. Settings: *1.7*, *1.9*.

Parallel Port IRQ
When parallel port is set to *Auto*, the item shows *Auto* indicating that BIOS determines the IRQ for the parallel port automatically.

Parallel Port DMA Channel
This feature needs to be configured only when *Parallel Port Mode* is set to the *ECP* mode. When parallel port is set to *Auto*, the field will show *Auto* indicating that BIOS automatically determines the DMA channel for the parallel port.

OnBoard Midi Port
The field specifies the base I/O port address for the onboard Midi Port.

Midi IRQ Select
The item is used to select the IRQ line for onboard Midi port.

OnBoard Game Port
This item is used to specify the address for the onboard game port.

PC Health Status

This section shows the status of your CPU, fan, and overall system status.

```
              AMIBIOS NEW SETUP UTILITY - VERSION 3.31a

     PC Health Status                      [  Setup Help  ]

  Chassis Intrusion          Disabled
    CPU Temperature          80°C/176°F
    System Temperature       39°C/102°F
    CPU Fan Speed
    System Fan Speed
    Power Fan Speed
    Vcore
      3.3V
    + 5.0V
    +12.0V
    -12.0V
    - 5.0V
    Battery
    +5V SB




   F1:Help      ↑↓:Select Item    +/-:Change Values    F7:Setup Defaults
   Esc:Previous Menu              Enter:Select ▶Sub-Menu  F6:Hi-Performance
```
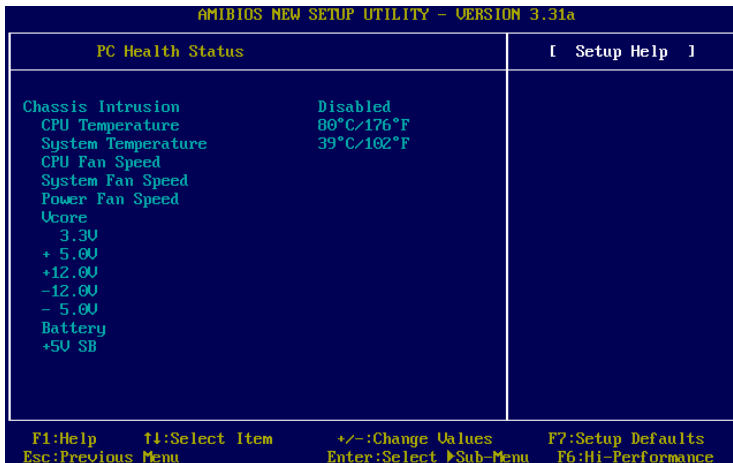
Chassis Intrusion
The field enables or disables the feature of recording the chassis intrusion status and issuing a warning message if the chassis is once opened. To clear the warning message, set the field to *Reset*. The setting of the field will automatically return to *Enabled* later. Settings: *Enabled*, *Reset*, *Disabled*.

CPU/System Temperature, CPU/System/Power Fan Speed, Vcore, 3.3V, + 5. 0V, +12.0V, -12.0V, -5.0V, Battery, +5V SB
These items display the current status of all of the monitored hardware devices/components such as CPU voltages, temperatures and all fans' speeds.

Frequency/Voltage Control

Use this menu to specify your settings for frequency/voltage control.

```
                AMIBIOS NEW SETUP UTILITY - VERSION 3.31a
┌──────────────────────────────────────────┬─────────────────────┐
│      Frequency/Voltage Control            │ [  Setup Help  ]    │
├──────────────────────────────────────────┤                     │
│ Spread Spectrum              Enabled      │                     │
│ CPU Ratio Selection           8.0x        │                     │
│ CPU FSB Clock (Mhz)           133         │                     │
│ CPU Vcore Adjust              No          │                     │
│  CPU Vcore                    1.500U      │                     │
│ DDR Power Voltage             2.5U        │                     │
│ AGP Power Voltage             1.5U        │                     │
│                                           │                     │
│                                           │                     │
│                                           │                     │
│                                           │                     │
│                                           │                     │
│                                           │                     │
├──────────────────────────────────────────┴─────────────────────┤
│ F1:Help      ↑↓:Select Item    +/-:Change Values   F7:Setup Defaults │
│ Esc:Previous Menu              Enter:Select ▶Sub-Menu  F6:Hi-Performance │
└─────────────────────────────────────────────────────────────────┘
```
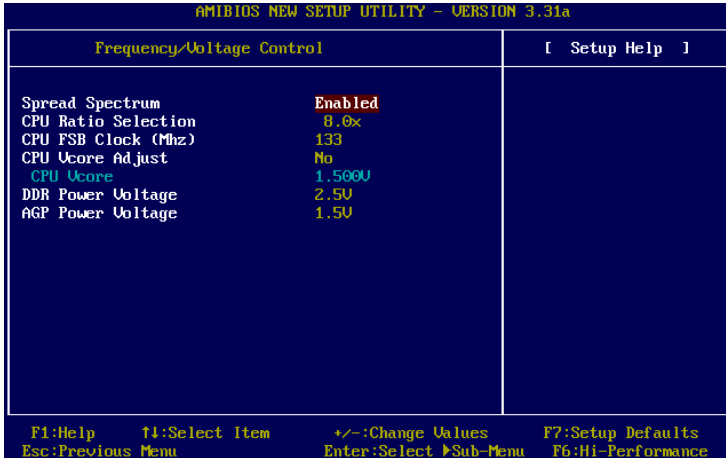
Spread Spectrum
When the motherboard clock generator pulses, the extreme values (spikes) of the pulses creates EMI (Electromagnetic Interference). The Spread Spectrum function reduces the EMI generated by modulating the pulses so that the spikes of the pulses are reduced to flatter curves. If you do not have any EMI problem, leave the setting at *Disabled* for optimal system stability and performance. But if you are plagued by EMI, setting to *Enabled* for EMI reduction. Remember to disable Spread Spectrum if you are overclocking because even a slight jitter can introduce a temporary boost in clockspeed which may just cause your overclocked processor to lock up.

CPU Ratio Selection
This setting controls the multiplier that is used to determine the internal clock speed of the processor relative to the external or motherboard clock speed.

CPU FSB Clock (Mhz)
This item allows you to select the CPU Front Side Bus clock frequency. Setting options range from *100 to 200*. If you install a CPU other than 100MHz FSB, you should change the setting to corresponding FSB

frequency; otherwise, the CPU will run at the default configuration 100MHz. The field also allows you to overclock the processor by adjusting the FSB clock to a higher frequency.

CPU Vcore Adjust
This setting is used to enable or disable the ability to adjust CPU Vcore for overclocking purpose. Setting options: *Yes, No*.

> **CPU Vcore**
> Specify preferred CPU core voltage (Vcore) in this field.

> *Note: Changing CPU Vcore could lead to a unstable system; therefore, it is NOT recommended to change the default setting for long-term usage.*

DDR/AGP Power Voltage
Adjusting the DDR/AGP voltage can increase the DDR/AGP speed. Any changes made to these settings may cause a stability issue, so ***changing the DDR/AGP voltage for long-term purpose is NOT recommended***.

Set Supervisor/User Password

When you select this function, a message as below will appear on the screen:

```
[ Enter new supervisor password ]
```

Type the password, up to six characters in length, and press <Enter>. The password typed now will replace any previously set password from CMOS memory. You will be prompted to confirm the password. Retype the password and press <Enter>. You may also press <Esc> to abort the selection and not enter a password.

To clear a set password, just press <Enter> when you are prompted to enter the password. A message will show up confirming the password will be disabled. Once the password is disabled, the system will boot and you can enter Setup without entering any password.

When a password has been set, you will be prompted to enter it every time you try to enter Setup. This prevents an unauthorized person from changing any part of your system configuration.

Additionally, when a password is enabled, you can also have AMIBIOS to request a password each time the system is booted. This would prevent unauthorized use of your computer. The setting to determine when the password prompt is required is the PASSWORD CHECK option of the ADVANCED BIOS FEATURES menu. If the PASSWORD CHECK option is set to *Always*, the password is required both at boot and at entry to Setup. If set to *Setup*, password prompt only occurs when you try to enter Setup.

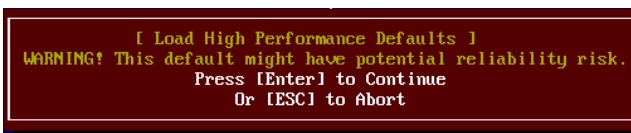*About Supervisor Password & User Password:*

Supervisor password:	*Can enter and change the settings of the setup menu.*
User password:	*Can only enter but do not have the right to change the settings of the setup menu.*

Load High Performance/BIOS Setup Defaults

The two options on the main menu allow users to restore all of the BIOS settings to High Performance defaults or BIOS Setup defaults. The High Performance Defaults are the default values set by the mainboard manufacturer for the best system performance but probably will cause a stability issue. The BIOS Setup Defaults are the default values also set by the mainboard manufacturer for stable performance of the mainboard.

When you select Load High Performance Defaults, a message as below appears:

```
              [ Load High Performance Defaults ]
 WARNING! This default might have potential reliability risk.
                   Press [Enter] to Continue
                      Or [ESC] to Abort
```

Pressing <Enter> loads the default BIOS values that enable the best system performance but may lead to a stability issue.

> **STOP**
> **WARNING!**
>
> ***The option is for power or overclocking users only***. *Use of high performance defaults will tighten most timings to increase the system performance. Therefore, a high-end system configuration is a must, which means you need high-quality VGA adapter, RAM and so on.* ***We don't recommend that users should apply the high performance defaults in their regular systems.*** *Otherwise, the system may become unstable or even crash. If the system crashes or hangs after enabling the feature, please CLEAR CMOS DATA to resolve the problem. For more information, refer to "Clear CMOS Jumper:JBAT1" in Chapter 2.*

When you select Load BIOS Setup Defaults, a message as below appears:

```
          [ Load BIOS Setup Defaults ]

          Press [Enter] to Continue
             Or [ESC] to Abort
```

Pressing <Enter> loads the default values that are factory settings for stable system performance.

Glossary

ACPI (*Advanced Configuration & Power Interface*)
This power management specification enables the OS (operating system) to control the amount of power given to each device attached to the computer. Windows 98/98SE, Windows 2000 and Windows ME can fully support ACPI to allow users managing the system power flexibly.

AGP (*Accelerated Graphics Port*)
A new, high-speed graphics interface that based on PCI construction and designed especially for the throughput demands of 3-D graphics. AGP provides a direct channel (32-bit wide bus) between the display controller and main memory for high graphics quality and performance.

ATX
A modern shape and layout of mainboard that supersedes the widely-used Baby AT form factor. It improves many placement of components and makes a more efficient design.

BIOS (*basic input/output system*)
On PCs, an essential software that contains all the control code of input/output interface (such as keyboard, disk drives, etc.). It executes hardware test on booting the system, starts the OS, and provides an interface between the OS and the components. The BIOS is stored in a ROM chip.

Bus
A set of hardware lines within the computer system, through which the data is transferred among different components. In a PC, the term ***bus*** usually refers to a local bus that connects the internal components to the CPU and main memory.

Cache
A special memory subsystem that is used to speed up the data transfer. It stores the contents of frequently accessed RAM locations and the addresses where these data items are stored.

Chipset
A collection of integrated chips designed to perform one or more related functions. For

example, a modem chipset contains all the primary circuits for transmitting and receiving data; a PC chipset provides the electronic interfaces between all subsystems.

CMOS (*complementary metal-oxide semiconductor*)
CMOS is a widely used type of semiconductor, which features high speed and low power consumption. PCs usually contain a small amount of battery-powered CMOS memory to retain the date, time, and system setup parameters.

COM
In MS-DOS system, the name of a serial communications port. DOS supports four serial ports. For example, if a modem is connected to one serial port and a serial mouse to another, they are identified as COM1 and COM2.

DIMM (*dual in-line memory module*)
A small circuit board that holds memory chips. A *SIMM (single in-line memory module)* has a 32-bit path to the memory chips whereas a DIMM has 64-bit path.

DRAM (*Dynamic RAM*)
A most common type of computer memory. It usually uses one transistor and a capacitor to represent a bit. As the development of technology, the memory type and specification used in computer becomes variety, such as SDRAM, DDR SDRAM, and RDRAM. For further instruction, please see the table below:

Dynamic RAM (DRAM) Memory Technologies					
Type	First Used	Clock Rate	Bus* Width	Peak Bandwidth	Volts
FPM (60,70ns)	1990	25MHz	64 bits	200 MBps	5v
EDO (50,60,70ns)	1994	40MHz	64 bits	320 MBps	5v
SDRAM (66MHz)	1996	66MHz	64 bits	528 MBps	3.3v
SDRAM (100MHz)	1998	100MHz	64 bits	800 MBps	3.3v
SDRAM (133MHz)	1999	133MHz	64 bits	1.1 GBps	3.3v
RDRAM (Direct Rambus)	1999	400MHz	16 bits	1.6 GBps	2.5v
DDR SDRAM (100MHz)	2000	100MHz	64 bits	1.6 GBps	3.3v
DDR SDRAM (133MHz)	2000	133MHz	64 bits	2.1 GBps	3.3v
* Memory channel width (64 bits started with 75MHz Pentium)					

Source: Computer Desktop Encyclopedia

ECC Memory (*error correcting code memory*)
A type of memory that contains special circuitry for testing the accuracy of data and correcting the errors on the fly.

IDE (*Integrated Drive Electronics*)
A type of disk-drive interface widely used to connect hard disks, CD-ROMs and tape drives to a PC, in which the controller electronics is integrated into the drive itself, eliminating the need for a separate adapter card. The IDE interface is known as the ATA (AT Attachment) specification.

IEEE 1394
A new, high speed external bus standard, also known as *FireWire* or *iLink*, which supports data transfer rates of up to 400 Mbps for connecting up to 63 external devices.

IrDA (*Infrared Data Association*)
A group of device vendors, including computer, component and telecommunications, who have developed a standard for transmitting data via infrared light waves. This enables you to transfer data from one device to another without any cables.

LAN (*local area network*)
A computer network that covers a relatively smaller area, such as in a building or an enterprise. It is made up of servers, workstations, shared resources, a network operating system and a communications link. These individual PCs and devices on a LAN are known as "nodes", and are connected by cables to access data and devices anywhere on the LAN, so that many users can share expensive devices and data.

LED (*light emitting diode*)
A semiconductor device that converts electrical energy into light. Since it lights up (usually red) when electricity is passed through it, it is usually used for the activity lights on computer's component, such as disk drivers.

LPT (*line printer terminal*)
Logical device name for a line printer; a name reserved by the MS-DOS for up to three parallel printer ports: LPT1, LPT2, and LPT3. It is frequently used by the OS to identify a printer.

PCI (*Peripheral Component Interconnect*)
A local bus standard developed by Intel that first appeared on PCs in late 1993. PCI provides "plug and play" capability and allows IRQs to be shared. The PCI controller can exchange data with the system's CPU either 32 bits or 64 bits at a time.

PnP (*Plug and Play*)
A set of specifications that allows a PC to configure itself automatically to work with peripherals. The user can "plug" in a peripheral device and "play" it without configuring the system manually. To implement this useful feature, both the BIOS that supports PnP and a PnP expansion card are required.

POST (*Power On Self Test*)
During booting up your system, the BIOS executes a series of diagnostic tests, include checking the RAM, the keyboard, the disk drives, etc., to see if they are properly connected and operating.

PS/2 Port
A type of port developed by IBM for connecting a mouse or keyboard to a PC. The PS/2 port supports a mini DIN plug containing just 6 pins. Most modern PCs equipped with PS/2 ports so that the special port can be used by another device, such as a modem.

USB (*universal serial bus*)
A hardware interface for low-speed peripherals such as the keyboard, mouse, joystick, etc. USB provides a maximum bandwidth of 12 Mbit/sec (Mbps) for connecting up to 127 peripheral devices to PC. USB features hot swap capability and multiple data streams, allows external devices to be plugged in and unplugged without turning the system off.

Virus
A program or a piece of code that infects computer files by inserting in those files copies of itself. The virus code is buried within an existing program, and is activated when that program is executed. All the viruses are man-made, and often have damaging side effects.